SELECTED TOPICS IN SPECIAL EDUCATION

David Baine

Selected Topics in Special Education is a publication resulting from the visit of Dr. David Baine to the Centre of Advanced Study in Psychology, Utkal University. During this visit throughout June and August, 1983, Dr. Baine gave a series of lectures and seminars on various aspects of special education which account for most of the topics in the book. His visit created an impact on the Centre that will continue to be influential years from now, and it was felt that the benefits of his visit should be made generally available to persons having an interest in special education; hence, this book.

Coming from one of the leading special educators in Canada, the book is certainly special, but what is most unique is that the book was tailor-made for Indian readers and keeps in view the Indian conditions of which Dr. Baine has shown remarkable understanding in the course of his recent visits to this country. The book covers a wide range of topics and issues in the field of special education. Many practical ideas and suggestions have been made. The text will certainly serve as handy reference for special educators and students of psychology and education.

Rs.65.00

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Books Published

1. Rath, R.: Psycho-Social Problems of Social Change. A.N. Sinha, Institute of Social Studies, Monograph 6, Allied Publishers, 1973.
2. Rath, R.: Cognitive Abilities and School Achievement of Socially Disadvantaged in Primary Schools. Monograph, Allied Publishers.
3. Chatterjee, B.B.: A Candle in Woodland-Kashraba Kanya Ashram, Niwali: Past, Present and Future. Allied Publishers, 1977.
4. Rath, R., Dash, A.S., Dash, U.N.: Cognitive Abilities and School Achievement of the Socially Disadvantaged Children in Primary Schools, Allied Publishers, 1979.
5. Puhan, B.N.: Assessment of Psychometric Invariance of the Cuechsler Adult Intelligence Scales. Allied Publishers, 1979.

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DAVID BAINE, Ed.D.
Visiting Professor
Utkal University
Vani Vihar, Bhubaneswar, India

S.C.E.R.T., West Bengal
Library
Calcutta
25/3, B. C. Road

ALLIED PUBLISHERS PRIVATE LIMITED
NEW DELHI BOMBAY CALCUTTA MADRAS
BANGALORE HYDERABAD AHMEDABAD

ALLIED PUBLISHERS PRIVATE LIMITED
Prarthna Flats, 1st Floor, Navrangpura, Ahmedabad 380009
15 J.N. Heredia Marg, Ballard Estate, Bombay 400038
3-5-1129 Kachiguda Cross Road, Hyderabad 500027
5th Main Road, Gandhinagar, Bangalore 560009
17 Chittaranjan Avenue, Calcutta 700072
13/14 Asaf Ali Road, New Delhi 110002
751 Mount Road, Madras 600002

S.C.E.R.T.. West Bengal
Date... 14-1-87
Acc. No... 3740
371.9
BAI

First published: 1986
© Utkal University, Bhubaneswar, 1986
ISBN 81-7023-082-9

PRINTED IN INDIA

Published by R.N. Sachdev and printed by Ravi Sachdev at Allied Publishers Pvt. Ltd.,
A-104 Mayapuri, Phase II, New Delhi 110064

Foreword

Selected Topics in Special Education is a specialized publication resulting from the visit of Dr. David Baine to the Centre of Advanced Study in Psychology, Utkal University. During this visit throughout June and August, 1983, Dr. Baine gave a series of lectures and seminars on various aspects of special education which account for most of the topics in the book. His visit created an impact on the Centre that will continue to be influential years from now, and it was felt that the benefits of his visit should be made generally available to persons having an interest in special education; hence, this book.

Coming from one of the leading special educators in Canada, the book is certainly special, but what is most unique is that the book was tailor-made for Indian readers and keeps in view the Indian conditions of which Dr. Baine has shown remarkable understanding in the course of his recent visits to this country. The book covers a wide range of topics and issues in the field of special education. It begins with a view of some controversial issues in the area of learning disabilities including the problems of definition and causation, and suggests methods of identifying and remedying learning disabilities. The chapter on norm-referenced and criterion-referenced testing discusses the limitations of norm-referenced tests and recommends use of criterion-referenced tests which have become increasingly popular with special educators throughout the world. The structure, function and preparation of criterion-referenced tests is also discussed. The author provides a very useful annotated bibliography of selected tests which, as he rightly points out, are not ecologically valid for India, but which can serve as models for the development of more suitable tests. Some specific problems with testing the achievements of mentally retarded persons are discussed in another chapter which also describes procedures to be followed when normative achievement tests are used. Limitations of using a 'normal' model of development for testing and designing of curricula for handicapped children are described in the chapter on the developmental model of tests and curricula. The chapter discusses an 'ecological inventory' method of curriculum development and describes 'steps' in development of a competency based instructional system. Such a system of instructional design, incorporating systems analysis, applied behaviour analysis, and direct instructional techniques is discussed in the chapter on instructional design. This chapter outlines a step-by-step procedure for developing a self-contained, prescriptive instructional programme. The direct instructional technique is illustrated in the chapter on Direct Instruction: Reading – a comprehensive technique for teaching skills. The last two chapters review the causes, diagnosis and treatment of auditory and visual disorders.

Clearly, the author has provided a lucid review of important concerns in special education. Many practical ideas and suggestions have been made. The text will certainly serve as a handy reference for special educators and students of psychology and education. The book is well-timed, coming at a point when Indian educators are showing an increasing awareness of the need for a well organized national programme of special education. The Centre of Advanced Study in Psychology is fortunate to have had Dr. David Baine as a Visiting Professor who readily responded to our request for writing such a book. Only time will reveal the extent of the significant impact of Dr. Baine's visit with us, but the book will certainly find its way into the hearts of professionals interested in special education.

AJIT K. MOHANTY
Ph.D. (Alberta)
Professor
Educational Psychology

Centre of Advanced Study in
Psychology
Utkal University
Bhubaneswar, India

Introducing the Author

Dr. David Baine, Associate Professor of Educational Psychology, University of Alberta, Canada, has invested his entire research and teaching career in the area of Special Education to become one of the leading Canadians in the area. His down-to-earth practical approach to issues in special education has significantly affected psychology. As a Visiting Professor at the Centre, Dr. Baine gave a number of lectures and seminars on various topics in the area of special education. *Selected Topics in Special Education* is a result of Dr. Baine's lectures and discussion with colleagues at the Centre. It is yet another example of a fruitful outcome of the Western ideas meeting the challenge of the Eastern conditions. Dr. Baine has taken a lot of pains in the book to make it appropriate to the circumstances in India, where, I am sure, the book will be much appreciated and widely read.

Dr. S.K. MISRA,
Ph.D. (Queen's)
Professor & Head
Educational Psychology

Centre of Advanced Study in
Psychology
Utkal University
Vani Vihar, Bhubaneswar, India

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CHAPTER 1

Learning Disabilities

A relatively large number of children in the school population (approximately 14%), for some unknown reason, experience considerable difficulty learning from the usual methods of instruction. Often these difficulties are in specific areas of performance such as language, reading and/or arithmetic. With the classification of these children as 'learning disabled', considerable social, educational, economic and legislative change has been made affecting their identification and treatment. The use of the term 'learning disabilities' has helped to focus the efforts of parents and professionals; a powerful lobby has been created resulting in the allocation of special funds for research, assessment and treatment. Parents have organized mutual help groups involved in the dissemination of information while increasing their own knowledge and the awareness of the general public, educators and legislators. Learning disabilities is considered by some people to be a relatively attractive term that escapes the stigma of mental retardation. There are no implications of neglect, emotional disturbance or improper training or eduation, nor does the term imply a lack of motivation on the part of the child (Hobbs, 1975).

The classification of learning disabilities has resulted in considerable benefit to some children and their families. For other children, however, the results have been quite destructive. The use of the term 'learning disabilities' presents a conflict. The discussion that follows reviews some of the many areas of controversy in the field of learning disabilities, and suggests alternative methods for identifying and remedying the problems experienced by children with learning difficulties.

Definitional problems

Most definitions of learning disabilities imply or state that: (a) a *discrepancy* exists between a child's potentialities and his achievement; (b) children are *excluded* from the category whose learning problems are due primarily to visual, hearing, or motor handicaps, to mental retardation, emotional disturbance or to cultural disadvantage; (c) reference is made to *minimal cerebral dysfunction* as an implied etiological factor producing; (d) disorders in one or more of the *basic psychological processes* manifest in difficulties with; reading, language and/or arithmetic. Each part of this definition is discussed below.

The discrepancy clause

Intelligence tests. The definition of learning disabilities states that a discrepancy exists between a child's intellectual potentialities and his school achievement. Usually a child's intellectual potentialities are assessed by an intelligence test. Learning disabled children are reported to have average or above average intelligence (potentiality), but significantly low achievement in one or more areas of academic performance.

How well do intelligence tests predict achievement? In the early grades, the correlation between intelligence and achievement is approximately. 65, indicating that intelligence accounts for approximately 41% of the variance observed in school achievement. Fifty-nine per cent of the variance, therefore, is accounted for by something other than intelligence. Because of the size of the correlation, some discrepancy between intelligence and achievement is to be expected. How large a discrepancy should exist before a diagnosis of learning disabilities is made? Salvia and Ysseldyke (1981) suggest that to establish the statistically significant difference between the results of the two tests, one must calculate the standard error of measure of the difference. This statistic should be separately calculated for each age and/or grade level considered. Usually, however, an analysis of this nature is not the basis for making diagnostic decisions. In fact, a delay of two years in achievement, regardless of a child's grade level or IQ, is usually considered to be indicative of the presence of a learning disability—providing that the IQ is within the normal range or higher. This crude measure of discrepancy, however, is not satisfactory, as a delay of two years at grade one is far more serious than a delay of two years at grade six. Similarly, delays of two years in achievement at IQ 90 and IQ 130 will not be equivalent.

For some populations, intelligence has been quite predictive of achievement. For example, in the past, the vast majority of Down's syndrome children have been classified as trainable, mentally retarded. Their academic achievements have been minimal. Hayden and Dmitriev (1975) and Hayden and Haring (1977), at the University of Washington, in Seattle, employed early intervention and special education techniques to reduce significantly the predictive validity of intelligence tests with Down's syndrome children. During the first four years of life, Down's syndrome children, reared at home, progressively decline in performance relative to normal children. Starting at a point equivalent to approximately 80% of the developmental level of normal children at the age of one month, the relative level of performance decreases to around 50% of normal between ages two and four (Clunies-Ross, 1979). Hayden, Dmitriev and Haring report that Down's syndrome children, who have been in the early intervention programme for up to five years, have advanced to a level where they achieve 95% of the tasks expected of normal children of the same chronological ages. Similar results have been observed in an Australian programme described by Clunies-Ross. After

12-24 months in that programme, nine of the 29 children reportedly achieved at or above the norms of their chronological ages in one or more areas of performance such as social, cognitive and fine-perceptual motor skills.

Longitudinal studies of the stability of intelligence (e.g., Bayley, 1955) have found that, on the average, intelligence is relatively constant from 6 years to 25 years of age (.75 correlation). On the other hand, it was also observed that the IQ of some individuals changed by as many as fifty points. In Bayley's study, changes of the following magnitude were observed: (a) 59% of the sample changed by 15 points or more; (b) 37% by 20 points or more; and 9% by 30 points or more. Bayley reported that these changes were not random fluctuations, but were consistent trends associated with environmental changes.

In view of this evidence, perhaps predictions should not be based on normative data where intellectual stability is predicted on the basis of environmental constancy, but upon atypical improvements in development that result from environmental modification. After all, the purpose of special education is not to maintain the status quo, but to systematically employ environmental modification to enhance development.

The following are two examples of environmental modification in special education that have resulted in significant increases in intelligence quotients. Skeels (1966) divided a group of mentally retarded, institutionalized infants into control and experimental groups. Children in the experimental group were each assigned to one of the institutional inmates for 'mothering'. Children in the control group continued to be cared for by ward staff in the usual manner. After 1.5 years, the experimental children exhibited an average increase in IQ of 28 points from 64 to 92. In the same period, children in the control group showed an average decrease of 26 IQ points. The children in the experimental group were later adopted by families outside of the institution. After 2.5 years, the IQ of these children increased by an average of 9.5 points of 101.

Becker and Engelmann (1976) examined the improvements in IQ and achievement of children, average pretest IQ 73, who had participated in the Direct Instruction Follow Through Programme. These children gained more than one grade level in reading achievement for each year in the programme. Arithmetic achievement was comparable. The amount of improvement in IQ was dependent upon the time of entry into the programme and the period of time in the programme: pre-k to post-k gain: 20.8 points; post-k to post-3 gain: 7.5; pre-1 to post-1 gain: 13.0; and post-1 to post-3 gain: 4.7. The authors report that, because of the exaggeration caused by the statistical regression, true gains would be approximately 70% of the reported gains.

Thus it appears that, on the average, IQ is a fairly good predictor of achievement, but only if there is environmental stability. However, given suitable environmental modification, special education, both intelligence and achievement may be significantly improved.

An additional point regarding the prediction of achievement from IQ relates to the skills measured by intelligence tests. Most of these tests measure many skills that *relate* to reading, but the tests do not *directly* measure *all* the skills *prerequisite* to reading. If intelligence tests did measure all the skills prerequisite to reading, they would be better predictors of reading achievement and the discrepancy between IQ and reading achievement would be reduced or removed. The discrepancy between IQ and achievement may not be the result of a learning disability, but may reflect an inadequate test that fails assess the presence or absence of skills prerequisite to the criterion it is used to predict.

Achivement tests. With what validity do achievement tests evaluate a child's school achievement? Nationally normed, standardized achievement tests are designed for average children, studying average curriculums in average classrooms across the nation. These tests frequently do not provide a valid assessment of the achievement of atypical children, using modified curriculums in special education classrooms.

During the development of norm-referenced achievement tests, such test items are selected as are most representative of the average national classroom. As a result, test items that are unique to individualized or special programmes are eliminated from the test. Test items that are selected are passed by 40-60% of the norm group. Therefore, items that the majority of students pass are removed. Thus, valuable information about low performing students is eliminated. A selection is made of those test items that best discriminate between the top 27% and the bottom 27% of the norm group. As a result, once again, valuable information about low performers is lost. Thus, norm-referenced achievement tests may assess some skills that are not taught in special education programmes. Similarly, the tests may fail to assess a number of skills that have been taught in special programmes. Where skills common to regular and special programmes are evaluated, the test stimulus and/or response formats, and/or the relative amount of emphasis upon each performance area may differ from that found in a special programme. As a result, norm-referenced achievement tests may provide the least amount of information about children for whom information is most important—students in special education programmes. It is apparent from these observations that intelligence tests and norm-referenced achievement tests do not provide sufficient information on which to diagnose, classify, or make educational decisions.

The exclusion clause

As previously mentioned, the classification of learning disabilities involves the exclusion of children whose learning problems are due primarily to visual, hearing or motor handicaps, to mental retardation, emotional disturbance or to environmental hardships. One of the problems arising from the use of the clause is that it is virtually impossible, in most cases, to discriminate with certainty between primary and secondary causes. Frequently, it is not possible to distinguish between children who have reading problems as a result of emotional disturbances, those who have emotional disturbances because of reading problems, or those whose reading and emotional problems are unrelated. Where the conditions exist in mild to moderate degrees, which is true of the vast majority of public school cases, it is nearly impossible to sort the children into discrete categories (Myers and Hammill, 1976). Many authors emphasize the fact that the similarities among children classified as emotionally disturbed, educable mentally retarded, or learning disabled far outweigh the differences regardless of primary or secondary causes (Hallahan and Kauffman, 1976). Furthermore, in view of a discrepancy between IQ and achievement, it seems reasonable that mentally retarded, emotionally disturbed, and culturally disadvantaged children could be considered learning disabled when their achievement is significantly below that predicted on the basis of their IQ and their primary disability. Thus, the exclusionary clause does not appear to assist classification, and it may, in fact, prevent some children from receiving appropriate treatment.

Minimal cerebral dysfunction

Reference is made in the definition of learning disabilities to minimal cerebral dysfunction as an implied etiological factor. A diagnosis of minimal cerebral dysfunction is made by the processes of inference and elimination. When no other cause of the disorder can be identified, and when a child exhibits poor gross and fine motor coordination, an inability to inhibit movement, impaired perceptual processing and learning problems in reading, language, and/or arithmetic, minimal cerebral dysfunction is presumed to exist. It is, however, rarely possible to identify the actual damage/dysfunction to which the learning disability is attributed or to identify any related injury or infection to the brain.

Proponents of the minimal cerebral dysfunction position claim that there are a variety of behavioural (e.g. hyperactivity, perceptual motor) and neurological (e.g. abnormal EEG) indicators that tend to cluster together in these children. Hallahan and Kauffman (1978) point out that there is no generally accepted empirical evidence to support such a claim. Robinson and Robinson (1976) claim that the differences among brain-damaged children far exceed the similarities among them. Furthermore, the authors suggest that, in future, it may well be that the category of brain damage will be considered meaningless since nearly all children will be regarded as having sustained some degree of trauma. Kalverboer (1976) and Ross (1977) concluded from their studies that all findings point to a complex relationship between the brain and behaviour, and suggest that linking any behaviour directly to an implication of brain damage is dangerous and unrealistic.

A diagnosis of brain damage is not educationally relevant. The relationship between brain damage and learning is not known; it is not a fixed or direct relationship (Ross, 1977). Some children after sustaining extensive demonstrable brain damage experience no change in their learning (Robinson and Robinson, 1976). The mere presence or absence of brain damage is not predictive of learning difficulties. One must also consider the location and extent of the injury, when in the individual's development the injury occurred, the present age of the individual, the time elapsed since the injury, the level of achievement before the injury, the amount and type of treatment received, the ability of the brain to compensate for injury, as well as personality and intellectual factors. Even if it were known that a child could not read because of a lesion in the angular gyrus, the remedial reading specialist would still have to plan remediation on the basis of behavioural observation (Bateman, 1964). A teacher must establish: (a) what specific prerequisite skills the child possesses, (b) what specific skills he/she lacks, (c) what skills he/she is "ready" to learn, and (d) how he/she responds to various forms of instruction and materials.

A diagnosis of minimal cerebral dysfunction not only fails to enhance educational planning, it also hinders the whole eductional process. The diagnosis makes reference to irreversible processes or states that are beyond the realm of an educator's control or responsibility. Often the diagnosis produces a feeling of helplessness among parents, teachers and the child. A self-fulfilling prophecy of failure develops and the participants become trapped in a circular rationalization: because the child is experiencing difficulty, he is assumed to have minimal brain dysfunction; he is having these difficulties because he has minimal cerebral dysfunction, and since the dysfunction cannot be modified, failure is inevitable.

Basic psychological processes

The definition of learning disabilities refers to disorders in the basic psychological processes. What are these processes? There is no generally accepted definition of psychological processes. "To some professionals, these processes involve such factors as memory, closure and feedback. To others, they are the psycholinguistic dimensions known as auding, vizing, and tacting at both the symbolic and automatic levels. To others, these are the skills that comprise particular abilities, for example, speech, reading, and arithmetic. To yet another group, they imply the transmission functions of perception, integration, and expression of both verbal and nonverbal material" (Myers and Hammill, p. 9, 1976). If all the ambiguous and superfluous phrases were deleted from the definition, only the following would remain: Children with specific learning disabilities exhibit problems in language, reading, and/or arithmetic. Haring and Bateman (1977) define learning disabilities simply and optimistically as a behavioural deficit almost always associated with academic performance that can be remedied by precise individualized instructional programming.

Terminology and labelling

Who are these children variously described as dyslexic, dysgraphic, dyscalculalic, aphasic hyperkinetic, perceptually handicapped, neurologically handicapped and learning disabled? Numerous symptoms have been described, such as hyperactivity, perceptual motor defects, emotional lability, attentional disorders, impulsiveness, as well as disorders of memory and conceptual thinking. Different terms have been used to describe the same symptoms such as excessive motor activity, hyperkinesis, hyperactivity, organic driveness, restlessness, motor obsessiveness, fidgitness, motor disinhibition and nervousness (Clements, 1966).

Generally, there is no indication as to how many or what combination of symptoms, or the degree to which any of the symptoms should be present to affirm a diagnosis of learning disabilities. In addition, many of these characteristics are commonly found among both normal children and those in various diagnostic categories including emotionally disturbed, educable mentally retarded, and culturally disadvantaged. Why classify such a heterogeneous group within one clinical category? Indeed, attempts have been made to define sub-categories of learning disabilities such as dyslexia and aphasia. By and large, such attempts have proved futile and the National Advisory Committee on Dyslexia and Related Reading Disorders concluded in 1969, after an extensive study, that in view of the divergencies of opinion, the term dyslexia serves no useful purpose. In fact, it appears that there are as many differences among children within any sub-category of learning disabilities as there are similarities among them in other sub-categories.

A number of advantages can be gained from grouping children with common characteristics and giving them a common label. Communication is simplified when it is no longer necessary to repeatedly describe an extensive list of characteristics. Comparison of research results is facilitated. Assistance is also given to the development of legislation, the distribution of finances and the planning of service delivery. The label provides an identity to and a focus on the activities of related interest groups. A label may offer many benefits to the group of individuals it classifies, but inasmuch as the label de-emphasizes the individuality of group members and emphasizes their negative characteristics, the effects upon individual group members may be quite damaging.

Labels influence the behaviour of those who hear and use them. If a child who refuses to go to school is labelled *truant*, an entirely different series of events is set in motion than if the child were labelled *school phobic* (Ross, 1977). Frequently, labels are relatively arbitrary and may be a result, as much from the professional discipline consulted, as from the characteristics of the child. Ross (1977) suggested, for example, that the same problem may be labelled as a minimal cerebral dysfunction by a neurologist, as a visual sequential memory problem by a psychologist, as an emotional disturbance by a psychiatrist, as a reading disability by an educator, and as dyslexia by a physician. Labels are too frequently used without an assessment of their possibly damaging influence. A label influences not only how other people view a child but also how he comes to view himself. The interaction of these two negative views may set up a self-fulfilling prophecy of failure.

Often labels focus on negative characteristics or emphasize inferred, irreversible, biological problems beyond the scope of educational remedies. These imagined stages of cerebral dysfunction or maturational lag that cannot be directly modified, are frequently used to rationalize the failure of educational interventions. These effects are most destructive, especially since all children, regardless of the source of their difficulties, are capable of learning. All children possess behaviours that are prerequisites to further development.

Many labels also give rise to circular reasoning whereby the classification of a group of behaviours becomes an explanation for the same behaviours. For example, when a child is observed to possess certain behaviours, he may be classified as learning disabled. Later the term learning disabilities may take on the status of an invisible state or process, when the term is used to explain why the child behaves as he does. In fact, the label is merely a description of behaviour rather than an explanation.

Causation

Many causes of learning disabilities have been postulated; in fact, like cancer, the number of possible etiological agents suggested stretches the imagination. Thus far, however, there is no conclusive evidence to indicate that any one cause or combination of causes is responsible or that any single remedy is available. There is, however, a necessity to continue to look for causes so that ultimately, wherever possible, it may be possible to work preventatively and correctively. Frequently, the search for and the promotion of single causes and remedies have been naive and destructive. Some researchers have postulated a single cause and a single remedy for all types of learning disabilities. Typically, in the search for the cause of any human condition, several relationships are observed. Occasionally there appears to be an 'obvious relationship' between a symptom and a cause. Further examination, however, usually reveals that in other cases where the 'symptom' is present the 'cause' is either absent or another 'obvious cause' seems to be responsible. Occasionally, too, the same 'cause' may be present in the absence of any symptoms. These difficulties in analysing cause and effect relationships are magnified when one begins to search for multiple causes. One combination of causes may give rise to a set of symptoms entirely different from those arising from another combination that appears to differ in only one small respect, or, in fact, the difference may not even be apparent.

Remediation

Treatment of learning disabilities has frequently been based on a presumed etiological factor such as (a) developmental lag, (b) lack of hemispheric dominance, (c) underdeveloped perceptual motor skills, (d) poor neurological organization, (e) dietary (metabolic) imbalances, or (f) the use of fluorescent lights. Treatment of this nature is founded upon the medical model in which the cause of a disorder is corrected to produce a change in the symptoms.

This approach to educational or remedial programming has been unsatisfactory for several reasons. First, there is no conclusive evidence to link any one cause or any combination of causes to any specific learning problem. Second, no single remedy or combination of remedies based on an etiological analysis have proved to be generally effective with individuals presumed to have been affected by the etiology. Three, there is ample evidence in the literature demonstrating that effective educational intervention may be conducted in the absence of any identified etiology. Four, to withhold treatment in the absence of an identified cause is inappropriate when other types of effective intervention are available. Five, to base interventions on wrongly identified causes such as diets or fluorescent lights, may actually worsen the problem. For example, Hammill and Larsen (1974), and Hammill and Wiederholdt (1972), after reviewing the research on remedial programmes based upon the Illinois Test of Psycholinguistic Abilities and the Frostig Developmental Test of Visual Perception concluded that the Frostig–Horne training programme in perception had no effect on reading and had a questionable effect on school readiness and perception itself. The authors also concluded that the efficacy of training psycholinguistic functioning has not been conclusively demonstrated and that programmes designed to improve such functioning should be viewed cautiously so that children experiencing difficulty in schools will not be subjected to meaningless and irrelevant activities resulting only in waste of valuable time.

The best evidence available indicates that regardless of diagnostic categories or etiological factors, empirically derived direct instructional procedures are the most effective form of educational intervention. This approach is characterized by (a) task-analysed sequences of skills, (b) criterion-referenced testing to identify the presence or absence of specific prerequisite skills, (c) continuous performance monitoring and prescriptive correction procedures, (d) prescripted teacher interactions that incorporate various instructional and motivational techniques with specially designed materials, as well as (e) programmed sequences of instruction to optimize acquisition, generalization and maintenance. Methods of this nature are described by Carnine and Silbert (1979), Silbert, Carnine and Stein (1981), and Engelmann and Carnine (1982).

Research

A number of difficulties arise when an attempt is made to research on learning disabilities. Some of these problems have resulted in erroneous conclusions regarding the effectiveness of various treatment techniques, explanations about the causes of learning disabilities, the characteristics of learning disabled individuals, and the ability to make early predictions of future academic problems. Many of the research problems are associated with the selection for study of samples of learning disabled children. Some researchers have selected samples using different definitions of learning disabilities; other investigators using the definition have used different tests. Occasionally there has been a failure to discriminate the various degrees to which the symptoms were present in different samples of children. Sometimes children were classified in terms of one or more similarities while influential differences were overlooked. Some children with learning disabilities are unintentionally eliminated from study. Because of the difficulties in identifying the effects of primary and secondary disorders, children who give the illusion of having psychogenic difficulties may be eliminated from further study. Children with minor impairments may escape detection in the same manner as children with very high potentialities who achieve within the normal range. Problems have also arisen where researchers have studied the same characteristics of children that lead to their initial diagnosis as learning disabled. For example, one should expect to find a high incidence of perceptual disorders among children who were initially classified as learning disabled on the basis of their perceptual disorders.

The characteristic performance variability of these children also impedes research; conclusions based on a few observations may fail to reflect their performance inconsistencies. Also, any research under highly controlled conditions may fail to reflect characteristic variations in behaviour in the natural environment. Faulty conclusions have been reached when researchers have failed to look for the presence of characteristics of learning disabilities in other populations of children including those who appear to function without difficulty.

The study and treatment of human behaviour is extremely complex and only a few of the many research problems have been described herein. Many additional problems have arisen from the failure to subject poorly founded opinion to any scientific test of validity. Unfortunately, when it comes to child rearing and education, opinion is plentiful and facts are hard to find. Failure to respect the complexities of these problems and the ardent promotion of untested opinions have created undue hardship for many children and their parents and teachers.

Conclusion

There is a relatively large group of *individuals* within the school system who for some unknown reason have difficulty in learning from the usual methods of instruction. This is a heterogeneous group characterized by their differences and their performance variability. No single cause or combination of causes has been identified to account for the multiplicity of problems exhibited. No single remedy or combination of remedies has been identified to correct the variety of difficulties. In the past, the term learning disabilities has brought some benefit to a previously neglected group of children having significant learning problems. Now, however, the term and the concept of learning disabilities have outlived their usefulness and now impede development in this field of study.

CHAPTER 2

Norm-Referenced and Criterion-Referenced Testing

Norm-referenced tests (NRT)

Norm-referenced achievement tests are designed to provide a global index of an examinee's achievement within a defined domain of instruction such as reading or arithmetic. Achievement is expressed in terms of derived scores: grade equivalent scores, percentiles and stanines developed to reflect an examinee's achievement relative to that of subjects within the norm group on which the test was standardized. A NRT battery such as the *Stanford Early School Achievement Test* (Madden, Gardner and Collins, 1981) includes several independent achievement subtests such as mathematics, word reading, and listening to words and stories. A separate score is obtained for each subtest. A number of limitations associated with NRTs are described below. Some points discussed in other chapters are briefly summarized while other topics are discussed more fully.

(a) As discussed earlier, NRTs attempting to represent the curriculum used in a hypothetical, average national classroom may not adequately represent any particular curriculum, especially one that has been individualized or adapted to special education.

(b) During construction of a NRT, test items are *randomly* selected from areas of the curriculum that are common to the largest number of classrooms. The number of items sampled from each area is proportionate to the relative amount of emphasis typically assigned to content in that area of the curriculum in the average classroom. Because of the random nature of item selection, all the subskills within a particular domain or subdomain may not be sampled. As a result, test performance may not reveal which particular skills an examinee does or does not possess. Also, because many of the subskills that are sampled are represented by only one or two test items, acquisition of any specific subskill cannot be reliably determined. That is, although the large number of items in an entire test may produce a reliable total score, the assessment of any particular subskill within the test may not be reliable. Thus, because of chance factors, a correct or incorrect response to a test item cannot be reliably interpreted to indicate the presence or absence of a particular skill. Also, the commission of a relatively large number of errors of a certain type may indicate either the presence of a particular deficit, or the existence of relatively more opportunities in the test to commit errors of that type. For example, on an oral reading achievement test an examinee may commit more errors with digraphs than with diphthongs merely because there were more digraphs than diphthongs in the passage read. In fact, the examinee may actually have more difficulty with diphthongs. Thus, a NRT cannot be used diagnostically.

(c) One important means by which NRTs are judged is in terms of their content validity. Content validity refers to the amount of congruence between the content of the test and that of the curriculum. If the test is content-valid, both the test and the curriculum place the same amount of emphasis on the same skills which are taught and tested in the same manner. Thus, as previously mentioned, the content of a NRT is derived from an analysis of a particular curriculum. If there is congruence between the test and the curriculum, the test is considered to be content-valid. However, an important question remains: Is the test *instructionally valid*, if it is based upon the content of a curriculum that does not include all and only the minimum essential subskills required to acquire particular skills? Instructional validity is a characteristic of a criterion-referenced test based upon an empirically validated task analysis. Instructional validity is frequently lacking in a norm-referenced test.

(d) Neither can a NRT be used effectively for instructional placement decisions. For one thing, two students with the same total score may have correctly answered different test items. These students may have different strengths and weaknesses, and possess different prerequisite skills. Two students, one in grade one, and the other in grade five, may obtain the same grade equivalent score of 3.5. Obviously these students should not be placed in the same instructional group. One child's achievements are accelerated, while those of the other child are retarded. Thus, these students may have different strengths and weaknesses, as well as different rates and styles of learning. According to Becker and Engelmann (1976) placements made on the basis of global achievement scores may be in error by two years or more. Placements on the basis of global achievement scores, rather than in terms of the presence or absence of specific prerequisite skills, may lead to a failure to teach essential skills. The absence of one skill prerequisite to five others, and each of them prerequisite to the acquisition of other skills, has an accumulative effect. As a result, a student may fall further and further behind in a specific area of performance. Are the students to whom this happens often referred to as learning disabled?

(e) As previously mentioned, test items on a NRT that best discriminate between the top 27% and the bottom 27% of the norm group are selected, and 40-60% of the group pass. A selection of the test items, made in this manner, eliminates valuable information about the particular skills that low achieving performers may or may not have acquired.

(f) Many NRTs, used to evaluate special populations of students, have purposefully excluded exceptional individuals from the norm group. The expressed intent of this procedure is to establish a standard of normal functioning with which to compare any deviations. Unfortunately, however, a test standardized in this manner may fail to reveal that the nature of the test actually causes an individual's handicap in one area of performance to interfere with his performance in another area that would not usually be affected by the handicap. For example, a cerebral palsied person, able to perform complex arithmetic calculations, may be impeded in rapidly and accurately recording his answers by the type of computerized response format used on a test. The Illinois Test of Psycholinguistic Abilities (Kirk, McCarthy and Kirk, 1968) usually used with mentally retarded, learning disabled and culturally handicapped children, was standardized on a norm group that included "only those children demonstrating average intellectual functioning, average school achievement, average characteristics of personal-social adjustment, sensory-motor integrity, and coming from predominantly English speaking families" (pp. 51-52). Evidence has been reported in the literature indicating that socio-economic and racial differences between the examinee and the examiner may seriously affect the performance of children on the verbal and manual expression tests. These children may be quite capable of richly detailed and animated discussion in familiar surroundings, but may feel quite inhibited in an alien testing environment. Unfortunately, although the ITPA is frequently used with lower socio-economic, racial minorities, persons of this nature have been excluded from the norm group.

The Developmental Test of Visual Perception (Frostig, 1963) is commonly used with children 3 to 10 years old, and older handicapped children suspected of having visual-perceptual difficulties. The test manual indicates that the test may be used with children who are deaf, cerebral palsied, brain damaged, mentally retarded and non-English. The standardization group, however, consisted of 93% middle class white children in California; no exceptional children were included. A norm-referenced test used to assess populations of individuals on whom it was not standardized may not be valid.

The Stanford series of achievement tests are among the most popular, comprehensive and well designed norm-referenced achievement tests currently in use. The series is composed of ten levels of tests from kindergarten to the end of grade thirteen. Refer to the annotated list of tests at the end of this chapter for a more complete description. The Stanford Early School Achievement Test, Level II (Madden, Gardner and Collins, 1981), is designed for children in K-1. This test battery comprises six independent achievement tests: sounds and letters, word reading, sentence reading, listening to words and stories, mathematics, and environment. A brief examination of the mathematics subtest provides examples of some of the limitations of norm-referenced tests.

The content and instructional validity of the following test items is questionable. The sample test item on page 10 displays two large cups, one with a handle and the other without, and two small cups, one with a handle. The child is asked to mark under the big cup *with a handle*. This item appears to confound assessment of the arithmetic concept large and small, with a measure of attention to visual detail that is unrelated to both arithmetic concepts and operations. Test item 3 (p. 10) is parallel: the examinee is asked to identify the *big* glass *that has water in it*. The item is designed to assess one's ability not to judge the glass with the largest volume of water in it, but to discriminate the largest glass, with water in it, from a glass of equal size, without water, and two smaller glasses, one of them with water. Test item 28 (p. 14) displays four baseballs. Each ball is shaded on the left or right side, top or bottom. The learner is required to mark under the ball that is shaded on the left-hand side. What essential arithmetic skill does this item measure? The skill is perhaps worthy of evaluation, but does it pertain to an arithmetic test?

The following test items illustrate the frequent lack of reliability that occurs when particular subskills are evaluated, and the associated lack of diagnostic information. Item 42 (p. 16) is the only item evaluating the examinee's ability to read the time from a clock face. Only two items (32 on p. 15, and 44 on p. 16) evaluate coin identification and the addition of coins. One item (43, p. 16) evaluates whether the examinee can recall

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the days of the week.

Three test items (47, 48 and 50 on p. 17) assess the examinee's ability to find the sum of columnar addition problems involving two or three single digit addends. Is this a sufficient number of items to reliably measure columnar addition? Since these test items come at the end of a fifty-item subtest, they may be among the most likely items to be influenced by chance factors as examinees rush to complete the subtest. The diagnostic value of these computation items is reduced by both the number and the nature of the items. These are multiple-choice test items where the type of errors that examinees may exhibit is constrained by the type of response choices provided. For some of the test items the response alternatives do not represent commonly found errors. For example, test item 47 (p. 17) presents the problem $7 + 3 =$ in a vertical format. Four alternative answers are provided: the correct answer 10; 11 and 9 representing the sum ± 1; the remaining choice being 2 which would seem to be a highly improbable error. Two errors that seem more likely are (a) a failure to identify the plus sign, and to subtract the numbers as was done in the previous test item to obtain an answer of 4, or (b) to add both numbers to obtain a sum of 73. These are only a few of the test items in the arithmetic subtest that are of questionable validity and reliability. One should not, however, overgeneralize to conclude that the entire test is without value. The points to be made are that (a) norm-referenced tests, in general, do have a number of limitations, and that (b) users of any type of test should be aware of these limitations and should carefully examine each test item.

Criterion-referenced tests (CRT)

As a result of some of the limitations associated with norm-referenced tests, criterion-referenced tests have recently found increasing popularity. Criterion-referenced tests have the potential to correct many of the shortcomings of norm-referenced assessments. Unfortunately, however, many CRTs are very poorly designed and perhaps of even less value than NRTs. In the following paragraphs, the construction, structure and function of an *ideal* CRT is discussed, followed by a description of commonly found variations and limitations of a CRT that are less than ideal.

Ideally, a CRT is designed in a 'top-down' manner. Terminal behavioural objectives are written to describe the highest areas of performance in a particular curriculum domain. These terminal objectives are task-analysed to determine the minimum essential subskills required to perform the task(s) described in the objective. These subskills are referred to as enabling skills as their acquisition enables a learner to proceed from his entry skill level to the terminal objective. Enabling behavioural objectives are developed for each enabling skill. The topics of task analysis and behavioural objectives are discussed more fully in the chapter on instructional design.

Each terminal objective and its related enabling skill objectives are organized into a strand as in Figure 2.1. The strand of skills illustrated has been divided into three modules of related skills. For each module, a modular behavioural objective is written. A number of test items are developed for each terminal, modular and enabling behavioural objective to provide a reliable measure of each skill. These test items may then be used either to screen achievement or to provide an in-depth evaluation. An examinee may first be screened on the test items for MBO_a and MBO_b. If he/she successfully reaches criterion for MBO_a, then the test items for MBO_b are administered. If the examinee fails to achieve criterion on MBO_b, then the test items for the enabling skills in that module are administered, starting with ebo_a. Testing proceeds upward as far as the examinee is able to reach criterion on each set of ebo test items. Suppose, for example, that an examinee was able to achieve criterion on all ebo test items except for those in ebo_d. The ebo_d would define the examinee's level of achievement in relation to MBO_b. A teacher would then know that prerequisite skills a learner did possess and did not, and where to begin instruction. Thus, testing and teaching are viewed as complementary activities.

	Test items	
12	TBO	———
11	ebo_c	——
10	ebo_b	——
9	ebo_a	——
8	MBO_b	———
7	ebo_d	——
6	ebo_c	——
5	ebo_b	——
4	ebo_a	——
3	MBO_a	———
2	ebo_b	——
1	ebo_a	——

Figure 2.1. Strand of terminal, modular, and enabling behavioural objectives

Resnick, Wang and Kaplan (1973) in an article in the *Journal of Applied Behaviour Analysis* described a CR arithmetic test developed in the same general manner as described above. The article also describes the empirical methods used to validate the test. A printed version of the test was prepared for distribution by Wang (1973) at the Learning Research and Development Centre at the University of Pittsburgh.

A criterion-referenced test of this nature may also be normed, so as to provide screening, achievement, *and* normative data. Test results may also be used to develop individual educational programmes, make instructional placement decisions, and evaluate the effectiveness of instruction.

Unfortunately, however, few 'criterion-referenced tests' are developed on the basis of task analysis. In fact, for the majority of criterion-referenced tests, test items are selected in the same manner as they are for NRTs—random selection of items from a specified domain. The two major differences between CRTs and NRTs of this type are: (a) each skill evaluated on the CRT is described in terms of a "behavioural objective", and (b) the CRT is usually not normed.

The behavioural objectives on these CRTs are often poorly written. The following objective is typical:

> Separates similar objects into categories (three different chairs, three different tables, etc.) with 85% accuracy.

Presumably, the statement is referred to as a behavioural objective, because the word 'separates' describes an observable, measurable behaviour. However, there are a number of characteristics of an acceptable behavioural objective that the statement does not possess. For example, the stimulus material to be separated is not adequately described. Of course there is a difference between tables and chairs, but the objective does not state whether there are also differences among the tables and among the chairs. If there are differences of this nature, how similar are the chairs to each other, and how different are they from the tables? Obviously, the number and degree of identical, similar, and different characteristics among and between categories will significantly influence the difficulty of the task.

The term 'etc.' in the statement indicates that one may include various sets of items to be separated. These items may be more or less difficult to separate than the tables and chairs. The separation of different sets of objects may also require the discrimination of various object characteristics. If the objective is intended to evaluate the presence of a skill that is prerequisite to a higher level of achievement, more precision is required in describing the minimum essential features of that skill.

A further limitation of the statement relates to the apparently arbitrary specification of 85% accuracy. What is the minimum essential standard of performance that is required before proceeding to a higher level of instruction? How is accuracy judged? If a single object is misplaced in a set, is the entire trial considered to be in error, or are points given for the objects that are correctly sorted? Is it acceptable to obtain 85% correct on each trial or 85% correct out of 100 trials? These standards of performance are too imprecise and subjective. Variations in the difficulty level of the conditions and standards presented may lead to unnecessarily holding a student back from proceeding to higher levels of instruction, or prematurely advancing him/her before mastery of the minimum essential skills. The chapter on instructional design provides examples of more precise behavioural objectives. Criterion-referenced tests (a) are not based on task analysis, (b) are not described in terms of precise behavioural objectives, (c) are not normed, and (d) do not provide information regarding item analysis, are of less value than NRTs.

The Brigance series of criterion-referenced tests provide a comprehensive inventory of skills in several test batteries ranging from birth to grade twelve. Refer to the annotated list of tests at the end of this chapter for a more complete description. These test batteries are very conveniently and attractively packaged; they are described as criterion-referenced and curriculum- or text-referenced. The tests appear to have a high degree of face validity, and they are currently among the most popular tests of their type. Unfortunately, these batteries are not well designed criterion-referenced tests, and a brief examination reveals some of their limitations.

The tests are not developed on the basis of an empirically validated task analysis; as a result, their instructional validity is questionable. One cannot be certain whether the tests evaluate achievement of all skills or only the skills prerequisite to development. The content of each test is reportedly derived from a review of the appropriate literature. However, no detailed description of these procedures or materials reviewed is provided. Thus, it is difficult to establish the content-validity of the tests. The Brigance K and 1 Screen (Brigance, 1982) reports in its manual that the skills included in this screening instrument were selected by using the following criteria: "Which skills does a review of the literature suggest or support as having the greatest predictive validity in kindergarten and grade one" (p. 111). The actual literature reviewed is not reported, nor is there any empirical evidence regarding predictive validity of the test.

Each of the tests has reportedly been subjected to a field study. The Brigance K and 1 Screen, for example, was field-tested in 31 schools in 13 states in the U.S. The manual reports that "one of the major objectives in the field study and critiquing process was to determine if the personnel (in the schools) concurred that the assessments selected for the Screen were appropriate and significant for screening kindergarten and first grade students" (p. 46). A table is provided in the manual showing what percentage of personnel rated each *subtest* (not individual item) as appropriate for kindergarten and first grade screening. One may conclude from these results that the subtests have face validity to a group of people working in various school systems.

A brief examination of some of these tests, however, indicates that criteria other than face validity should have been considered when deciding whether to include, exclude, or modify subtests and individual test items. For example, the Brigance Diagnostic Test of Basic Skills (Brigance, 1977) includes a subtest of auditory discrimination that is similar to the Wepman Test of Auditory Discrimination (Wepman, 1973). The test consists of a number of word pairs like "mad-mad," "gum-gub". The words are read to the examinee who is to indicate if the words in each pair are the same, by saying "Yes" or "No". No evidence of the content or construct validity of the test is provided.

Salvia and Ysseldyke (1981) summarize their review of the Wepman Test as follows: "No evidence of content or criterion related validity is presented in the manual ... it is questionable whether the items appropriately and completely measure the domain. For example, the two words in the different word pairs differ only in placement of the articulators. There is no pair that tests discrimination of: 1. acoustic characteristics [such as a stop-burst sound (t) versus an affricative (ch)], or 2.

voicing of the sound versus nonvoicing (s versus z, for example). Also, some of the more frequently misarticulated sounds (r, l, w, y,) are not even included in the test. In fact, Wintz (1975) concludes that the Auditory Discrimination Test does not provide the information needed to assess validly a child's auditory discrimination abilities.... The ADT should be used only with caution and a thorough knowledge of its shortcomings (p. 405)." This advice would be well taken when considering most of the subtests in the Brigance series. The Brigance Auditory Discrimination Test not only fails to report construct, content and predictive validity, and reliability, but also fails to provide any normative data for comparison or decision making.

Two tests on the Brigance K and 1 Screen are of questionable validity. One of these tests is a colour naming test in which the examinee is required to name the colour of ten different objects that have been illustrated. Colour naming is a skill frequently associated with kindergarten and grade 1, and presumably, therefore, a test item of this nature has face validity for inclusion in a K and 1 Screen. One must ask, however, whether colour naming is a skill prerequisite to the acquisition of other essential skills in kindergarten and grade 1. Could a child who failed in this test item succeed in K and 1? If he fails in this test item, should the *deficit* be remedied? If so, with what priority? Should this skill be included in a readiness/screening test? What is its predictive validity?

Similarly, the gross motor skills subtest of the K and 1 Screen does not appear to be predictive of readiness for academic learning. The test may appear to have face validity for inclusion in a K and 1 screening test because children at this age level can usually hop on one foot, stand on one foot momentarily, and walk heel to toe. However, the inability to perform these tasks does not prevent children crippled by cerebral palsy, polio, or auto accidents from achieving academically. Similar skills are evaluated on the Purdue Perceptual Motor Survey (Roach and Kephart, 1966). This survey was reviewed in the Seventh Buros Mental

Measurements Yearbook (Buros, 1972) by Jamison who wrote, "It has not been shown that the skills are necessary for academic learning (p. 1283). The claims for usefulness of the survey are in sharp contrast to the lack of evidence for its validity" (p. 1284). The same comments apply to the Brigance K and 1 Screen and gross motor skills subtest.

Several of the Brigance tests are referred to as diagnostic. These tests are diagnostic to the extent that they provide a separate evaluation of performance within a number of subareas of a domain like reading. However, there is no way to compare the relative strength and weakness of each subarea. A lower relative standing on a particular scale may result (a) if the test items on that scale are relatively more difficult, (b) if the skills being measured come later in the developmental sequence than do the other skills being evaluated, or (c) if the examinee does, in fact, have a deficit in that area of performance. To compare performance on different subtests, each subscale should possess a high degree of reliability; no evidence of reliability is reported. The authors may claim that the scale is diagnostic in that it indicates which specific skills the examinee does or does not possess in each subarea. However, without evidence of reliability, and evidence that all of the necessary skills within any subarea of performance have been evaluated, the tests do not provide a satisfactory diagnostic measure.

Annotated bibliography of selected tests

The following is an annotated bibliography of selected tests designed for use in regular and/or special education. Generally, these are some of the most commonly used and respected tests. Many commonly used tests have been excluded from the list because of their questionable psychometric qualities or limited instructional value. Inclusion of a test in the list, however, should not be interpreted as a recommendation. None of the tests listed is considered to be *ecologically valid* for use in India. Skills having little functional relevance to the Indian environment have been assessed, while skills that are essential might have been omitted. Frequently, also, where ecologically valid skills are evaluated, the pictures, terminology or concepts used in the test may be inappropriate to India. In addition, the norms established in Western countries are not suitable. For these reasons, a vast majority of the tests published in Western countries are not ecologically valid for use in India. The tests listed below have been selected as representative samples of particular types of tests having characteristics that, as described earlier in this chapter, one may wish either to adopt or to avoid while developing suitable tests for India. Tests of auditory and visual performance are discussed in the respective chapters on these topics.

Reviews of most tests currently in use are printed in the *Mental Measurements Yearbook (MMY)* series (see Buros, 1972). Because the MMY is published with several years between each edition, a book entitled *Tests in print*, also available from Gryphon Press, lists the newly published tests in each area that will be reviewed in successive volumes of the Yearbook. Reportedly, a review of tests available in India, similar to the MMY, is currently being prepared by the National Council of Educational Research and Training in New Delhi. A book by Compton (1980) provides *A Guide to 65 Tests for Special Education.* A textbook by Salvia and Ysseldyke (1981) entitled *Assessment in Special and Remedial Education* provides an excellent review of testing theory and practice. Testing within the major domains of performance is discussed as are a number of specific tests in each area.

1. Instructional Objectives Exchange (IOX), P.O. Box 24095, Los Angeles, California, 90024. The IOX collection comprises (a) objective based test sets used for measuring achievement in reading, language arts and mathematics for grades k-6, and (b) measurable objective collections used for curriculum design in most areas of instruction in grades k-12. The achievement test materials may be used for

group and individual administration. The tests are not developed from a task analysis, but from a sampling of widely used textbooks, curriculum guides, and instructional programmes. Because each test covers a broad range of skills from k-6, or higher, the objectives are similar to modular objectives; all enabling skills are not evaluated. The tests are not ecologically valid for use in India. The IOX instructional objectives in the test sets and objective collections are *excellent* and provide a good example for the design of criterion-referenced tests.

2. The Brigance series of criterion-referenced achievement tests comprises:
    (a) *Brigance Diagnostic Inventory of Basic Skills*, 1977. Kindergarten to grade six. CRT. Text-referenced. Twelve subscales of reading, language arts and mathematics performance.
    (b) *Brigance Diagnostic Inventory of Early Development*, 1978. Birth to seven years. CRT. Gives *estimates* of developmental age. NRT. Eleven subscales of motor, self-help, communication, readiness, reading, arithmetic and printing performance.
    (c) *Brigance Diagnostic Inventory of Essential Skills*, 1980. Secondary school level. CRT. Evaluates achivement in various areas of reading, language arts, arithmetic, health and safety, vocational, self-help and communication.
    (d) *Brigance K and 1 Screen*, 1982. CRT. Evaluates colour recognition, picture labelling, visual discrimination, copying, gross motor, counting, identification of body parts, direction following, printing and language.
    These tests are available from Curriculum Associates Inc., 5 Esquire Road, North Billerica, MA, 01862-2589.

The Brigance tests are among the most popular 'criterion-referenced' tests. The materials are attractive, convenient and have high face validity. However, no evidence of content, construct or predictive validity, nor reliability is provided. No norms are provided, and the sources of the 'developmental ages' reported in the Inventory of Early Development are not described. Although all the tests were reportedly submitted to field-testing, a detailed description of these procedures and their outcome is not provided. Test items were not selected on the basis of task analysis but upon a review of textbooks, curriculum guides and instructional programmes. No description is provided of the materials reviewed. These tests are not ecologically valid for use in India. Characteristics of these tests have been reviewed in this chapter under the subheading 'criterion-referenced tests'. These tests provide examples of a number of common faults in 'criterion-referenced' tests.

3. The Stanford series of norm-referenced achievement tests includes:
   (a) *Stanford Early School Achievement Test*. SESAT1: 1981. (k.0-k.9) and SESAT2 (k.5-1.9). Assessing sounds and letters, word reading, sentence reading (level 2), listening to words and stories, mathematics and environment.
   (b) *Stanford Achivement Test, Primary 1*, 1982 (1.5-2.9), *Primary 2*, 1982 (2.5-3.9), *Primary 3*, 1982 (3.5-4.9). Assesses word study skills, word reading (primary 1 and 2), reading comprehension, vocabulary, listening comprehension, spelling, language (primary 3), writing (primary 3), concepts of numbers, mathematics computation and application, and environment (primary 1 and 2).
   (c) *Intermediate 1* (4.5-5.9), *Intermediate 2* (5.5-7.9).
   (d) *Advanced* (7.0-9.9).
   (e) *Stanford Test of Academic Skills*, TASK 1 (7.0-9.9), TASK 2 (9.0-13).

   The tests in categories (c), (d) and (e) are generally parallel to those in Primary 3; English replaces language in TASK 2 and TASK 3, and the three arithmetic tests are replaced by a single mathematics test on TASK 2 and TASK 3.

The Stanford series of achievement tests are generally considered to be the best designed and standardized of the norm-referenced, group-administered achievement tests. These tests are not ecologically valid for use in India. The Stanford tests may serve as a model for the development of parallel tests; however, one is referred to the discussion on the limitations of norm-referenced testing presented earlier in this chapter. The tests are available from Harcourt Brace Jovanovich, Publishers, 757 Third Avenue, New York, N.Y. 10017.

4. *Developmental Profile II*, 1980, Revised Edition. Alpern, G. D., Bell, T. J. and Shearer, M. S. Psychological Development Publications, P.O. Box 3198, Aspen, Colorado, 81612. Range: birth to 9 years of age. This is a norm-referenced interview checklist based on the normal model of development. The instrument records motor, language, personal/self-help, social and intellectual development. A developmental age, and an intelligence quotient equivalency score can be calculated. The scale is not ecologically valid for use in India. For further discussion, refer to the chapter on the developmental model of tests and curricula.
5. *Uniform Performance Assessment*, UPAS, 1981. Haring, N. G., White, O. R., Edgar, E. B., Affleck, J. Q., and Hayden, A. H. (authors), and Munson, R. G. and Bendersky (eds.). Charles E. Merrill Publishing Company, Columbus, Ohio, 43216, 1981. The UPAS was developed at the Experimental Education Unit of the University of Washington in Seattle, Washington. These criterion-referenced tests of preacademic, communication, social and self-help, as well as gross motor skills are designed for children from birth to 6 years of age. An evaluation is also made of inappropriate behaviours. The materials, based on the normal sequence of development, are said to represent a reasonable outline of what most people would teach young or low functioning pupils. Most items have instructional relevance; in addition, 'red flag items' are

included to assess physical or sensory difficulties that may require referral. The test is designed to be adapted to children with various handicaps; a number of types of adaptations are suggested. Psychometric information is provided. This test is not ecologically valid for use in India. For further discussion refer to the chapter on the developmental model of tests and curricula. This test serves as a good model of a 'criterion referenced' preschool test based on the normative model of development.

6. *Basic School Skills Inventory Screen*, 1983. Hammell, D. D. and Leigh, J. E. PRO-ED. 5341 Industrial Oaks Blvd., Austin, Texas, 78735. This is a 20-item, norm-referenced test, individually administered, and used to identify children 4, 5 and 6 years of age, who may be 'high risk' for school failure. The scale was standardized on a sample of 376 children who approximate the population characteristics of children at this age level in the United States. Standard scores and percentiles are used to define cut-off points for potentially 'high-risk' children. The scale appears to be moderately valid and reliable, and worthy of consideration as a screening device to determine if more extensive testing is required. The scale evaluates information about coins and numbers, as well as vocabulary, speech, language, motor skills, alphabet, personal information, and sight vocabulary. The scale would require some modification and standardization for use in India; it appears to be a good model to follow for test development.
7. *Denver Developmental Screening Test*. Revised 1975. Frankenburg, Dodds, Fandal, Kazuk and Cohrs. University of Colorado Medical Centre, Denver, Colorado, U.S.A. This is an individually administered, norm-referenced screening device for early identification of children with developmental and behavioural problems. The scale is intended for use with children from birth to 6 years of age. Various areas of development are evaluated: personal-social, fine motor, language and

gross motor. Information about norms is unacceptable; validity and reliability are adequate. The scale is not ecologically valid for India, but the test presents an acceptable model for adoption. Refer to the chapter on the developmental model of tests and curricula for further discussion of tests of this nature.

8. *Key Math: Diagnostic Arithmetic Test* (1977). Connolly, A. J., Natchman, W., and Pritchett, E. M. American Guidance Service Inc., Publishers Building, Circle Pines, Minnesota, 55014. This is an individually administered, norm-referenced, diagnostic test evaluating arithmetic content, operations and applications in fourteen different areas of performance from kindergarten to the eighth grade. This test, although very popular, reports unacceptable levels of reliability and validity. The scale is not ecologically valid for use in India, although it has many interesting features that warrant further study.
9. *Enright Diagnostic Inventory of Basic Arithmetic Skills*, 1983. Enright, B. E. Curriculum Associates Inc., 5 Esquire Road, North Billerica, MA 61862-2589. This is an individually administered, criterion- and text-referenced, task-analysed diagnostic test of 144 basic computational skills. There are placement tests indicating where to begin in-depth testing, equivalent forms of a basic facts test and also a skills test, as well as a convenient diagnostic error analysis for each skill measured. Although the manual refers to a field study, and two levels of statistical analysis, no related information was presented in the information reviewed. Perhaps additional psychometric information is available elsewhere. Nevertheless, the design and format of this test is exemplary and worthy of further study. Furthermore, it appears that the test, in its present form, may be suitable for use in India.
10. *Stanford Diagnostic Mathematics Test*, 1976. Beatty, L., Madden, R., and Gardner, E. F. Harcourt Brace Jovanovich Inc., 757 Third Avenue, New York, N.Y. 10017. This is a group-administered, norm-referenced, diagnostic test.

The test has four levels. The red level is for use at the end of grade 1, grade 2 and grade 3, and for low performers in grade 4. Green is for grade 4 and grade 5; brown: grade 6 and grade 7; and blue: grades 8 through 12. All the four levels of the test evaluate whole numbers, decimal place value, rational numbers, operations and properties, problem solving, reading and interpreting tables and graphs, as well as geometry and measurement. The red level is concerned with addition, subtraction and number sentences as well; the green level evaluates multiplication and division of whole numbers. Further, the brown level assesses fractions and decimals, while the blue level evaluates percentages. The test, although not ecologically valid for India, provides a suitable model for the development of a norm-referenced, diagnostic achievement test.

11. *Stanford Diagnostic Reading Test*, 1976. Karlsen, B., Madden, R. and Gardner, E. F. Harcourt Brace Jovanovich Inc., 757 Third Avenue, New York, N.Y. 10017. This is a group-administered, norm-referenced, diagnostic achievement test having four levels. The red level is for end of grade 1 to beginning of grade 3: auditory discrimination, phonics, auditory vocabulary, word recognition and comprehension of short sentences and paragraphs. The green level is intended for grade 3, grade 4 and b w grade 5: auditory discrimination, phonetic and structural anlysis, auditory vocabulary, and comprehension. The brown and blue levels are, respectively, for grades 5-8 and 9-12 and community college. Of its type, this is a respected test. However, the test is not ecologically valid for India, and is recommended only as a model for study.
12. *Fry Oral Reading Test*, 1971. Edward Fry, Rutgers University Reading Centre, New Brunswick, New Jersey. The test comprises nine short paragraphs. Oral reading errors are counted to calculate the independent, instructional and frustration levels of reading. Given this

information, one may use the Fry Readability Graph to select reading materials at the appropriate grade level. This test may be considered a *gross screening* device for the selection of appropriate reading materials to be used in a more extensive informal diagnosis. The test is not ecologically valid for use in India. For more comprehensive testing, the Informal Reading Assessment described below is recommended.

13. *Informal Reading Assessment*, 1980. Burns, P. C., and Roe, B. D. Houghton Mifflin Company, Boston, Mass. This is an individually administered test designed for preprimer to the twelfth grade. The test comprises graded word lists and graded passages. Performance on the word lists is used to select the appropriate passages for further testing. A variety of comprehension questions accompanies each passage. To administer the test, one must be skilled in rapidly and accurately recording any oral reading error that may occur. The manual describes methods for recording seven types of reading errors. Words were selected for the word lists following a survey of two basal reading series; the norms were then subjected to a difficulty analysis. The same basal reading series was used to select the paragraphs. The Fry Readability Graph and the Spache Readability formula were used to check the readability of each paragraph. This is an informal test and no validity, reliability or normative data is reported. The test is not ecologically valid for India, but is recommended as a good model for an informal reading inventory.
14. *AAMD Adaptive Behavior Scale,* School Edition, 1981. Lambert, N., Windmiller, M., Tharinger, D., and Cole, L. Publishers Test Service, a division of CTB, McGraw-Hill, Del Monte Research Park, Monterey, California, 93940. Mental retardation is defined as significant subaverage, general intellectual functioning occurring during the developmental period, plus a deficit in adaptive behaviour. The *AAMD Adaptive Behavior Scale* has

been designed to determine if and where significant deficits in adaptive behaviour exist. Norms are provided for children 3 to 16 years of age in regular classes, and classes for trainable, mentally retarded children in public schools. Norms are available for school-aged educable mentally retarded children in public schools. The scale is a checklist completed by teachers, parents, psychologists and/or others who are knowledgeable about the individual being evaluated. The scale is divided into two parts. Part 1 evaluates the presence of skills related to personal independence in daily living: independent functioning, physical development, economic activity, language development, number and time, prevocational activity, self-direction, responsibility and socialization. Several subdomains are evaluated in most of these areas. Part 2 of the scale evaluates the presence of maladaptive behaviours such as aggressiveness, withdrawal, and mannerisms. Twelve types of problematic behaviour are evaluated. The scale permits diagnostic interpretation; this analysis is supported by factor analytic studies. An annotated bibliography of instructional materials, relating to each of the domains evaluated, is provided in Part 1. Detailed information regarding reliability, validity and standardization is provided. One's ability to adapt is obviously related to a particular cultural context. As a result, although the scale provides an excellent model, it is not ecologically valid for use in India. The chapter on instructional design in this text briefly refers to methods used to conduct an ecological inventory. It is recommended that methods similar to these be adopted as a means of developing adaptive behaviour scales for India. In a country as heterogeneous as India, separate adaptive behaviour scales would have to be developed for urban and rural communities, as well as for different geographical and cultural regions. A scale of this nature may be used for the development of functional life skills training programmes to complement the conventional academic forms of instruction. Functional life skills training would seem to be of the highest priority in a predominantly rural society, and in a society in transition. The *AAMD Adaptive Behaviour Scale* provides an excellent model.

15. *Behaviour Rating Profile*, 1983. Brown, L., and Hammill, D. PRO-ED. 5341 Industrial Oaks Boulevard, Austin, Texas 78735. The profile consists of three norm-referenced rating checklists completed by a student, his parents, and his teacher, as well as a sociogram completed by his classmates. The scale is designed to evaluate students suspected of being "emotionally disturbed, behaviourally disordered, or learning disabled" (p. 1). Satisfactory evidence is presented to support content validity and reliability. The scale is not ecologically valid for use in India, but the general design is recommended for use as an initial screening device.
16. *Walker Problem Identification Checklist*, Revised 1976. Walker, H. M. Western Psychological Services, 12031 Wilshire Boulevard, Los Angeles, California 90025. The checklist consists of operationally defined statements about classroom behaviour, and is used as a screening device for emotionally disturbed and socially maladjusted behaviour. The scale is completed by a classroom teacher. Evidence of validity and reliability is presented. The checklist is not ecologically valid for use in India.

CHAPTER 3

Testing the Achievements of Mentally Retarded Persons

Test standardization

Many tests that claim to be suitable for the assessment of various groups of exceptional individuals have not been standardized on those groups. As a result, these tests may not be valid measures of the skills they have been designed to assess. For example, physically handicapped children, who initially are mentally and physically able to respond to a test, may with prolonged testing suffer fatigue, with the result that a test of academic achievement may become more a measure of endurance. Fair and Birch (1971) found that by including a rest period between sections of the Stanford Achievement Test, the scores of physically handicapped children were significantly improved while the scores of non-handicapped children remained unaffected. In a similar manner, the academic performance of children who have sensory, emotional, social, or other types of impairment may be unduly affected by some testing formats, procedures, or environments in a manner that does not reflect their usual ability to perform. If a test has not been standardized on a group of disabled individuals for whom it is used, then one cannot know the degree to which the test *causes* the disability to interfere with typical performance, thereby reducing the validity of the test.

Nationally normed achievement tests designed for average students in average classrooms across the nation frequently do not provide a valid measure of what is taught to exceptional students in special programmes. These tests are not content-valid. They may assess some skills not taught in the special education programme, may fail to assess skills that have been taught, and where skills taught are assessed, the stimulus and/or response formats may be quite different from those used in instruction. This topic is more fully discussed in the chapter on *Learning Disabilities* under the subheading *Achievement Tests*. The discussion applies equally well to both learning disabled and mentally retarded students. The discussion is also extended in the chapter on norm-referenced and criterion-referenced testing.

Personality influences

Robinson and Robinson (1976) describe a number of studies showing the influence upon performance of several personality characteristics found among the mentally retarded. Many of these studies, described in the following paragraphs, have been carried out in experimental situations. The same effects on performance, however, may be expected to occur in a testing situation where similar conditions exist.

Mentally retarded children, adolescents and young adults have shown considerably higher levels of anxiety than have non-retarded persons of the same age or younger (Cochran and Cleland, 1963; Malpass et al., 1960; and Silverstein, 1970). Studies have shown that the scores of mentally retarded individuals on standardized tests decrease as measured test anxiety increases (Wiener, Crawford and Snyder, 1960). A similar effect has been observed on intelligence test performance (Wrightsman, 1962) and on tests of reading ability (Reger, 1964).

Several studies of socially deprived, mentally retarded adults and children, in and out of institutions, have found that mentally retarded individuals exhibit competing positive and negative reaction tendencies. In children deprived of warm, adult, social contact, there is an eagerness to interact in an experimental situation. Among children with a history of negative social experiences, there is some reluctance to interact (Harter, 1967; Weaver, 1966; Zigler, Balla and Butterfield, 1968). The degree of positive or negative tendency expressed in an experimental situation is influenced both by the child's past history of interaction with adults and the social condition under which the experiment is conducted. A warm, reinforcing and attentive experimenter will elicit more effort for a longer period of time than an experimenter who is socially neutral or unresponsive (Weaver, 1966). A positive reaction tendency can also interfere with performance. Harter (1967) found that institutionalized retarded subjects were so highly motivated to interact with the experimenter that their attentiveness to the task was reduced.

Children with a history of failure may learn simply to expect and passively accept failure. Noonan and Barry (1967) found that such children may make stereotyped responses that reflect a lack of active effort or involvement. These children may also be willing to accept low rates of success.

Frequent experience of failure may also lead a child to mistrust his abilities and to look to the experimenter for guidance (Zigler et al., 1968). Yanob and Zigler (1971) found that, in experimental situations, retarded children most deficient in the concepts demanded, tended to perform in the most outerdirected fashion. Oversensitivity to external models may lead to distractibility or lack of concentration (Turnure, 1973). In a test-taking situation, outerdirectedness may lead a child to misinterpret the significance of casual examiner behaviours such as the presence or absence of eye-contact, and nods or smiles that are unrelated to the accuracy of the child's performance.

Instructional relevance

One major purpose of achievement tests is to provide a normative comparison of student performance with a common standard. The information derived from this comparison is frequently used to determine student grade placement and instructional placement within grades. Becker and Engelmann (1976) suggest that "placement assignments through norm-referenced tests can be off by two years or more. Because norm-referenced achievement tests are designed to satisfy the needs of many programs, they are likely only to be a crude placement device for any particular program" (p. 165).

Several problems relate to the placement of children according to global achievement test scores. The assumption that children with the same score have the same skills is invalid. Children with the same scores may not have answered the same questions correctly and may, therefore, have different strengths and weaknesses. These children may also have different rates and styles of learning. For example, if two children, one in grade two and the other in grade six, obtain the same grade equivalent score of four, one child may be a retarded learner while the other may be an accelerated one. Children with the same score on a test may differ with respect to strengths, weaknesses, rate and style of learning, and should not necessarily be placed in the same instructional group.

Because there is a degree of error in all tests, each score that is obtained is really only an estimate of a child's *real score* (the score that would be obtained if there were no error in the test). Each score should be recorded with a plus and minus value to reflect the degree of accuracy of the test. Because of the imprecision of achievement tests, some test publishers recommend that achievement test scores should be converted into *stanines*. Thus, the scale of all possible scores is divided into nine equal units or stanines. It is frequently suggested that students with the same stanine should be put into the same instructional group. The imprecision of the stanine scores, however, adds to the problem of attempting to put children into homogeneous instructional groups. For example, two children may obtain scores that place them, respectively, at the top and at the bottom of the fifth stanine. They might, therefore, be placed in the same instructional group. However, if the minus and plus error value were calculated, the *real* score for each child might actually be in the fourth and the sixth stanines. Thus, there may be considerable difference between the achievements of the two children.

In a search for instructionally relevant diagnostic information, one may analyse an examinee's performance on questions within subtests. Several problems are associated with a diagnostic analysis of subtest performance. First, each achievement test (e.g., arithmetic) is designed to sample a child's achievement in many different areas of performance. A single score is calculated to represent the average level of performance across all these areas. Because of the many areas of performance that might be sampled, and because of the limitations on test length, not all areas of performance may be sampled and only a few test questions may be selected from any area that is sampled. Because of the broad variety of different types of performance sampled on the test, the total score may be relatively reliable. However, because of the limited number of questions sampled within any subarea, assessment of that area will be less reliable. Therefore, conclusions about performance based on asnwers given to a few questions within a performance area may not be reliable. Failure on a particular type of test question may indicate lack of skill within that area of performance. Alternatively, the error may have arisen from random guessing. A child's response to a test may not represent his best effort. It is not always possible to obtain a high degree of motivation from a mentally retarded individual who may look upon a test as another opportunity for failure. Perhaps it is less personally destructive to fail on a test by not trying to perform well, than it is to fail after exerting one's best effort. Random guessing may also occur towards the end of a test where it may be wiser to guess the answer to ten questions than to correctly calculate the answer to one. Errors may also indicate carelessness, transient distraction and inattention to details. Brain damaged children are frequently characterized by their performance variability; deficits that appear at one time cannot at other times be detected. Failure may also result from ambiguous or poorly phrased questions. There are many possible explanations as to why a child may fail on a question which he is otherwise capable of answering correctly. Thus, great care must be exercised to avoid placing undue significance on a few errors. During the test some problems may appear which do not generally appear, while other more common problems may be temporarily absent.

An additional problem sometimes occurs with the diagnostic analysis of performance within subtests. Achievement tests are designed to discriminate the various levels of achievement among students. Tests with questions that everyone either passes or fails would not assist discrimination as everyone would get the same score. To discriminate maximally among various levels of achievement, test designers prefer questions that approximately fifty per cent of the children pass and fifty per cent fail. Questions that all or the majority of the children pass are eliminated from the test. These are the questions that low achievers are most likely to answer correctly. Thus, the amount of information on the test to indicate what low achievers can and cannot do has been reduced.

Diagnostic tests are designed, not to provide a single score within an area of performance (e.g., arithmetic), but to provide several scores to indicate subareas of relative strength and weaknesses. Because these tests use many more questions to assess performance within each subarea than are used to measure the same skills on an achievement test, they usually provide a more reliable score than achievement tests do. Hammill (1971), however, warns that "most presently available standardized 'diagnostic' batteries lack the necessary reliability upon which to base effective educational interventions for individual children" (p. 346). Hammill also stated that the validity and reliability of tests are correspondingly reduced as groups of children with successively lower levels of IQ are tested.

Conclusion

In view of the variety of problems associated with achievement testing, some authors have suggested that normative achievement tests should be disbanded in favour of diagnostic or criterion-referenced achievement tests. These latter tests offer certain advantages, however, in reflecting the complexity of human behaviour and its measurement. But these tests are not without limitations of their own. Other authors have suggested that the three types of tests provide different kinds of information and that they may be used in a complementary manner.

If normative achievement tests are to be used, certain procedures should be followed to ensure that the tests are used in a valid and reliable manner.

1. The test to be selected should measure the same skills, question and answer formats, and levels of performance with the same degree of emphasis that was taught in the classroom.
2. The test must be standardized on the type of handicapped individuals for whom it is to be used.
3. When a test has not been appropriately standardized (the usual case) the scores should be interpreted with a larger margin of error than is usually allowed, to account for the possible effects upon performance of the child's handicap, his performance history, and the nature of the testing environment.
4. A valid test should not assess the child's ability to understand the instructions; the instructions must be stated in a form that the child can readily understand. Ideally, an examiner should evaluate the child's comprehension of the instructions before proceeding with each part of the test.
5. Where standardized tests are administered simultaneously to a group of children, it is difficult, if not impossible, to observe individual performance on each part of the test. As a result, considerable potential diagnostic information is

lost. An examiner is unable to observe where confusion, guessing, inattention, distraction or other factors have influenced performance.

6. Wherever possible, testing should be done on an individual basis where variations in performance can be observed, where attention and effort can be reinforced to increase the validity of the test, and where testing procedures can be adapted to individual needs.
7. To the extent the basic standardized administration procedures of a test are modified to meet individual needs, the use of the norms becomes invalid.
8. In view of the nature of many mentally retarded children, test administration should be well structured in terms of the timing and sequence of performance. Tests should be administered at relatively short intervals separated by ample rest periods. The time and task requirements of the test should be specified in advance. In addition, the reinforcement available on completion of the test for "doing one's best work" should be described in advance. The testing environment should be free from distraction. The focusing of attention on relevant aspects of the task is crucial. In addition to removing auditory and visual distractions from the general environment, portions of the test page may be temporarily covered and the examiner may use his finger to focus the child's attention on a particular part of the page. In becoming thus involved, the examiner must be careful not to become distracting or to provide inadvertent clues to adversely influence the child's performance. Recall, too, that performance within a 'clinical situation' may not be representative of performance in the 'natural environment'.
9. Testing should be incorporated as an integral part of a diagnostic approach to teaching. Informal testing and systematic observation within the classroom will provide invaluable information about the child's characteristic rate and style of response under typical classroom conditions.

It is apparent from the foregoing discussion that testing is a complex procedure requiring considerable expertise in selection, administration, scoring and interpretation. To participate effectively in any of these activities, an individual should be thoroughly familiar with the purpose of various types of test, their method of construction, the selection of norm groups, standardization and administration procedures, validity and reliability, and the interpretation, uses and limitations of various derived scores.

CHAPTER 4

The Developmental Model of Tests and Curricula

Tests and curricula designed for normal preschool children and for older handicapped children functioning at the preschool level are frequently based on the normal model of development. In the absence of a model or models describing the sequence(s) of development of various types of handicapped children, the model of normal development appears to be a reasonable starting point for evaluating and teaching handicapped individuals. However, there are a number of limitations inherent in this approach.

If the course of normal development is significantly influenced by experience, and if that experience is frequently suboptimal, then the normal sequence of development may not be optimal for either normal or handicapped children. Possibly, different types of children under various conditions may vary quite significantly in number, nature, sequence and duration of each development stage. For example, the sensory, physical and cognitive deficits of handicapped children may influence the nature of their experience and their development. Adelson and Fraiberg (1975) when comparing the development of infants blind from birth, with that of non-handicapped infants, observed that blind infants exhibited a delay in the acquisition of some behaviours, failed to acquire others, resequenced the order in which some skills were learned, and acquired some unique compensatory behaviours. Similarly, Guess, Sailor and Baer (1976), while developing a language programme for severely handicapped children, found that the children radically departed from the normal pattern of development in their acquisition of speech and language skills. Indeed, it can be said with some confidence that handicapped individuals frequently deviate quite significantly from normal developmental sequences (White and Haring, 1978; White 1980a, White, 1980b).

If instructional programmes strictly adhere to the normal sequence of development, several difficulties may arise. For instance, when a mentally retarded individual is taught skills that relate to his mental age rather than his chronological age, he is not taught skills that are functionally related to his current environmental demands. Burton (1981), when commenting on this problem asked, why must children unable to feed, dress and toilet themselves be taught colours, shapes, numbers, puzzles and pegboards? Are these tasks, usually included on a normal development schedule, prerequisite to the acquisition of functional skills? No! Children may become quite proficient at pegboards and puzzles, but may not exhibit any improvement in their rate of acquisition of functional skills. For example, Hammill and Weiderholdt (1972), after reviewing a number of research studies of the efficacy of the Frostig–Horne remedial programme, concluded that training visual motor skills such as eye–hand coordination, spatial relations and figure–ground did not produce a significant improvement in reading and writing to which the visual motor skills were thought to have been related.

When remediation focuses on a child's mental age level, when the child learns at a slower than average rate of development, he will not only remain behind the development of his chronological age peers, but will also fall even further behind. Is it necessary to focus instruction on a child's mental age level? No! As demonstrated repeatedly by Brown (1979) and his colleagues at the University of Wisconsin, it is possible to develop chronological, age-appropriate and functional curricular content for severely handicapped adolescents and young adults. In terms of mental age, these individuals might ordinarily have been given tasks like matching parquetry block designs, repeating a block or bead pattern, putting pegs in a pegboard, and walking a balance beam–tasks commonly included in curricula based on the normal developmental model. Instead, these individuals were taught age-appropriate functional skills like food preparation, telephone use, shopping, bus riding, and vocational skills (Snell, 1983). Because of this change in the focus of instruction, many severely mentally retarded persons, previously locked away in institutions, are now living and working in the general community.

Developmental approaches to instruction frequently lead to the selection of isolated instructional objectives like *grasping* taken from a domain organized around motor development (Snell, 1983). The skill of grasping is often not taught as an integral part of a functional task existing in the individual's current or future environment. As a result, although the student may learn to grasp in the desired manner under artificial instructional conditions, the skill may not transfer to the general environment where different conditions may exist, and where slight modifications in the behaviour may be required.

Thus, because of the subsequent disuse of the grasping response, it may not be retained in the student's repertoire. Failure to maintain the skill may lead some practitioners to the conclusion that it is not worth the time, effort and cost of teaching severely handicapped persons. In fact, had the grasping response been integrated into one or more functional skills which the student could use in his daily life, and which would lead to naturally occurring positive consequences, the probability of retaining the skill would be significantly increased.

Brown et al. (1979) have developed a method of curriculum development called the ecological inventory. The purpose of this approach is to develop a curriculum comprising functional skills which are required in a student's contemporary and/or future life spaces and permit the individual to function as normatively, age-appropriately, and independently as possible in the least restrictive environment. The steps involved in an ecological inventory are as follows.

1. A survey is conducted to identify the current and future least restrictive *environments* in which a handicapped individual can function. A study is made of the following environments: (a) family and domestic, (b) community, (c) recreation, (d) school, and (e) vocational/occupational.
2. *Subenvironments* within each area are identified. For example, subenvironment at school (kindergarten) might be: (a) lunch area, (b) bathroom, (c) hallway, (d) classroom, (e) playground, etc.
3. Then the *tasks* within each subarea are listed. For example, classroom tasks might be (a) responding to the teacher in large group, teacher-directed activities, (b) participating in cooperative small group activities, and (c) completing individual seat work.
4. In the final stage, the *skills* required to perform each task are identified. For example, see Vincent et al. (1980) for a description of the competencies required for survival in kindergarten. The skills required to function effectively in the variety of current and future environments are then organized into instructional sequences or curricula, thus ensuring that all the skills necessary for functioning are included in the instructional programme.

Normative developmental schedules, tests and curricula are derived on the basis of a cross-sectional analysis of what normal children, under the usual range of conditions, are typically capable of performing at various age levels. Test items that are selected are easily administered, in a controlled manner, with little equipment, and indicate levels of development of isolated skills or skills in combination. Developmental schedules are not derived in a 'top-down' task-analytic approach where one:

1. identifies the knowledge and skills required of six year old children in various common environmental domains;
2. task-analyses these skills to determine the minimum essential prerequisite subskills, and
3. rank-orders these skills in order of difficulty, and according to when they are usually acquired.

As a result of the manner in which normative developmental schedules are developed, they may not list all the skills prerequisite to development and, in addition, they may list a number of non-essential skills such as bead stringing and block designing. Activities of this nature may teach generic skills like pincer grasp, eye–hand coordination, colour discrimination, and shape discrimination. However, as mentioned earlier, these skills frequently do not generalize. Stokes and Bear (1975) have written an excellent review of problems associated with generalization and methods of enhancing transfer. Guess and his colleagues (1978, 1982) and Holvoet et al. (1980) have experimented with a non-developmental curriculum sequencing model that involves the clustering of skills from various domains to enhance acquisition, generalization and maintenance.

Guess et al. have suggested that skills should be taught in clusters of 2-6 behaviours sequenced in the order in which they commonly occur in the natural environment. In this procedure skills with similar topographical and/or functional components are taught together to facilitate response generalization. For example, a child may be concurrently taught to put on his shoes, label his shoes, and sort clothing, including shoes, into categories. The common stimulus 'shoe' is designed to facilitate generalization. Within the self-help domain, a child may be taught concurrently to: (a) grasp and push a doorknob, (b) grasp and push a wheelchair, and (c) grasp and pull down a shirt to facilitate acquisition of a generalized, functional grasping response.

When teaching handicapped children, teachers must ensure that the instructional sequence contains only the skills necessary for development. As Becker, Engelmann and Carnine (1976) have demonstrated with the DISTAR reading, language and arithmetic programmes, when instruction is based on task-analysed sequences and direct instructional procedures, it is possible for mentally retarded students to learn more than one year of growth during one year of instruction. This evidence indicates that with appropriate instruction, mentally retarded persons are able to learn more rapidly than normal children with typical methods of instruction.

Among normal children there is a relative consistency with respect to the age and sequence in which developmental milestones are achieved. This consistency of development is sometimes interpreted to reflect the basic constitutional nature of children and some unalterable sequence of development. However, if the model of normal development is based upon the observation of normal children living within an average range of conditions, to what extent is the observed commonality a function of a similarity among the nature of the children or a similarity about the nature of their experiences?

To believe that the commonality arises from the basic nature of the child helps to ensure that retarded children remain retarded. For example, the constitutional approach is frequently associated with the concept of *readiness* which dictates that a child must be of mental age six before he/she is ready to learn to read. Thus, a child of IQ 50 would have to wait until age twelve before the commencement of reading instruction. During the period of waiting, valuable instructional time may be lost, and at age twelve, there may be other instructional priorities with little time left for reading instruction.

On the other hand, if one believes that the nature of a child's experience greatly influences the rate, type and sequence of his development, then instead of waiting for maturational readiness, one may intervene to teach the child any skills for which he has the prerequisites. Hayden and Dmitriev (1975), Hayden and Haring (1977) and Clunies-Ross (1979) adopted this approach when they taught Down's syndrome children to read *before* age six.

The cross-sectional analysis of what children are typically capable of performing under the usual range of conditions does not sample deviant forms of development that occur in non-normative variations in conditions. The elimination from study of this part of the population is unfortunate as some of the deviations may be in a positive direction and the conditions by which the changes were achieved may be replicated. The chapter on learning disabilities describes several studies in which special environmental changes were instrumental in producing significantly greater changes in growth than would have been predicted by a normative model of development. As was suggested in that chapter, perhaps curricula and instructional methods should not be based on a normative model that frequently leads to a decelerating rate of growth for handicapped children, but upon deviant methods and sequences of intervention that have successfully demonstrated accelerating rates of development. Special education means special methods to facilitate development that would not otherwise be possible.

Thus, instead of simply adopting the normative model of development as a basis on which to design tests and curricula for handicapped persons, several alternative considerations might be made. For example, the following steps describe the development of a criterion-referenced or competency-based sequence of functional skills:

1. Design test-teach sequences based on an ecological inventory of the tasks children at each chronological age level are, or will be, required to perform to function optimally in the variety of environments found in the changing sociocultural, physical context within which they live.
2. Use task-analyses to determine the minimum essential subskills required to perform each of the tasks listed in the ecological inventory.

3. While listing the subskills, describe two or more tasks that are or will be required in the child's current or immediate future environments and within which the subskill should be integrated to facilitate functional skill acquisition, maintenance and generalization.
4. Specify minimum essential standards of performance for each subskill to ensure that children are neither unnecessarily withheld from progress along the continuum of development, nor advanced prematurely to demands for which they are not adequately prepared.
5. For each subskill, describe prosthetic adaptations and compensatory skills that will facilitate acquisition of the subskills by children with various handicaps.
6. Empirically validate the ability of the sequence of subskills to prepare children with specific characteristics to fulfil the task requirements listed in the ecological inventory.

CHAPTER 5

Instructional Design

With the passing in the United States in 1975 of Public Law 94-142, *all* handicapped children are insured by law of obtaining an appropriate individualized educational programme (IEP) in the least restrictive environment. The law requires, among other things, that a child's annual educational programme specify (a) his present level of achievement, (b) annual and short-term instructional objectives, and (c) scheduled times and criteria for evaluating achievement of these goals. These requirements have increased teacher accountability and the demand for valid and efficient instructional methods and materials. The effects of PL 94-142 have been felt throughout North America, and perhaps most other parts of the world in which there are special education programmes.

The following discussion provides an introduction to a method of instructional design that incorporates systems analysis, applied behaviour analysis and direct instructional techniques. The method describes a step-by-step procedure for developing self-contained, prescripted instructional programmes. The instructional design model is more fully described in *Instructional Design for Special Education* (Baine, 1982). Figure 5.1 provides a graphic summary of the major steps involved in instructional design. Each of these steps is described in the following pages.

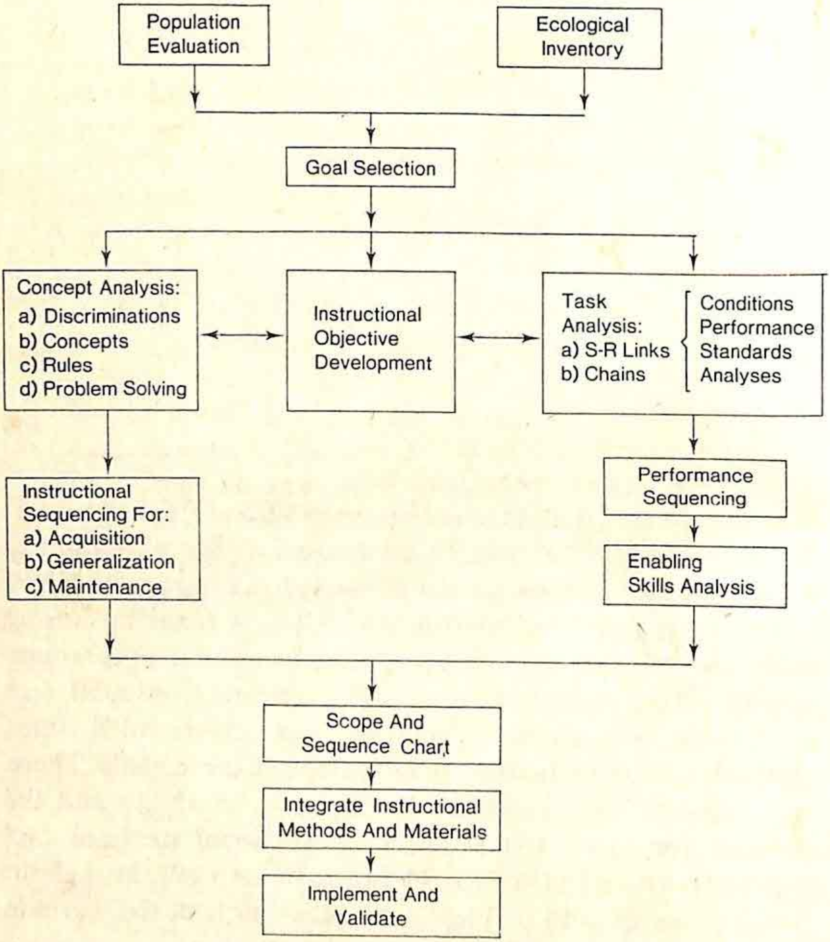


Figure 5.1. Major steps in instructional design

Population evaluation

A learner evaluation is conducted in various areas of performance to determine (a) the level of achievement of the lowest, average, and highest performers in the population, (b) how members of the population characteristically respond to various instructional conditions, and (c) population characteristics in motor, communication, sensory, social-personal, and cognitive areas of performance. The purpose of the evaluation is to establish (a) what skills have been mastered (entry-level skills) and (b) which learner characteristics will facilitate or impede acquisition of new knowledge or skills. This information assists in the selection of appropriate instructional goals and implementation of methods to achieve them.

Three types of assessment are conducted. The first is described as an *in situ* evaluation. This procedure involves repeated, objective observation and recording of operationally defined behaviours occurring in the natural environment. The purpose of the evaluation is to sample reliably the learner's characteristic mode of response to usual variations in conditions in the natural context. For example, observations may be made of (a) the types of instructional stimuli to which the learner attends, (b) distracting stimuli, (c) duration of attention under various conditions, (d) response to group instruction, (e) ability to complete individual seat work, (f) types of teacher assistance required, and (g) maintenance of learning from one instructional session to the next.

The second type of learner evaluation involves a criterion-referenced achievement screening. The purpose of this evaluation is to determine the general level of achievement in various areas of performance. This information will assist in defining relative areas of strength and weakness, indicate the need for further testing, and assist in the selection of instructional priorities.

The third type of learner evaluation is diagnostic. There are two purposes of this evaluation. The first purpose is to obtain detailed information about specific skills present and absent in various areas of performance. The second purpose is to experiment with various instructional techniques and materials to determine methods by which learner achievement can be accelerated.

Ecological inventory

An ecological inventory (Brown et al., 1979) involves a comprehensive study of an individual's contemporary and future, least restrictive environments of interaction. The task requirements in current and future environments are analysed to determine what subskills a person would require to perform each task. The procedure for conducting an ecological inventory is more fully described in the chapter on the developmental model of tests and curricula. The purpose of the inventory is to obtain information about current and future task demands, the skills required to fulfil these demands, and establish priorities within and between various areas of performance.

Goal selection and priorization

The information from the population evaluation and from the ecological inventory is used to select and priorize goals. The following considerations are made in these endeavours:

1. Can the skill be used frequently now and/or in the near future in a functional and reinforcing manner in one or more areas of performance?
2. Will the skill facilitate independent, normative functioning in a broad range of environments?
3. Will acquisition of the skill facilitate or impede acquisition or maintenance of other skills?
4. Does the learner possess all the skills prerequisite to acquisition of the goal?
5. Will the manner in which the skill is to be taught require the learner to 'unlearn' any skills he has already acquired?
6. Is the probability relatively high so that the learner will be able to achieve the goal?
7. Would acquisition of the new skill replace the existing negative behaviours by providing the child with positive

functional modes of response (Evans, Voeltz, and Hanashiro, 1981)?

8. Would persons in the natural environment reinforce the learner for displaying this skill? (Evans et al.)
9. Are there necessary personnel, materials and time available to facilitate acquisition of the goal?

Concept and task analyses: instructional objective development

The next stage in the development of a programme involves three concurrent activities. The instructional goal is translated into an instructional objective. The information used to write the objective is derived from a task analysis and/or a concept analysis. The process begins with the development of a tentative behavioural objective. Then, if discriminations, concepts, rules or problem solving are involved, a concept analysis is conducted. Alternatively, if S-R links or chains are involved, a task analysis is performed. As the task and/or concept analyses are being conducted, the instructional objective is refined. Whether or not the instructional objective is concerned with S-R links, chains, or concepts, etc., is determined by Gagne's taxonomy. Instructional objectives, task analysis, Gagne's taxonomy and concept analysis are discussed in the paragraphs that follow.

Instructional objectives. There are two major kinds of instructional objectives. Programme instructional objectives describe the skills which students will be able to perform upon successful completion of a programme. Enabling instructional objectives describe the subskills a student must acquire to be able to achieve the programme objectives. Both types of objectives have three parts: (a) a performance statement: a description of the observable, measureable behaviour the learner must perform to demonstrate acquisition of a skill, (b) a conditions statement: a description of the conditions under which the behaviour will be performed, and (c) a standards statement: a description of the criteria by which mastery of the behaviour will be judged. The conditions, performance and standards statements are derived from a task analysis.

An instructional objective describes the most difficult commonly found conditions, and the most common range of conditions. To enhance generalization, the *conditions statement* may specify three different environments in which the behaviour is to be performed, three sets of control figures (parents, peers, teachers, and/or others), and/or three sets of situational controls (verbal, social and/or physical circumstances). The objective describes the *major* conditions that are present or absent and will *most probably* facilitate or hinder performance.

The *performance statement* provides an operational definition of the observable, measureable behaviour the learner will be required to perform. Performance statements refer not to cognitive, perceptual or affective behaviours, but to easily verifiable acts such as (a) *writing* the product, (b) *sorting* into separate piles, or (c) *reading aloud.*

The *standards statement* specifies the minimum acceptable standards of performance required to demonstrate (a) mastery and termination of instruction of the skills being taught, or (b) readiness to graduate to another level or type of instruction into which the skill being taught will be incorporated and further refined. Standards should be carefully chosen so as not to impede progress or advance a student prematurely. Where the standards may not require 100% accuracy, types of acceptable and unacceptable errors should be specified. A sufficient number of trials should be conducted under each set of conditions to ensure a reliable measure of each type of performance. Where some types of errors are permissible, it may be desirable to specify their distribution under various conditions. To obtain a measure of maintenance, trials may be conducted after successively longer periods following completion of instruction. A sample of goal and instructional objective follows:

GOAL: TO TEACH THE CHILD TO READ 3-LETTER WORDS

INSTRUCTIONAL OBJECTIVE

Conditions statement

Given four examples of each of the following types of three-letter words

(a) vcv: ate
(b) cvc: cat
(c) ccv: the
(d) cvc: toy

where each word has a short vowel (e.g., *cat*), or a long vowel (e.g., *ate*), digraph (e.g., *the*) or diphthong (e.g., *toy*); where the words may have a continuous sound (e.g., a), or a stop sound (e.g., c) in the initial, medial or final position; where the words have not been included in previous phonics instruction; and where the child has recently demonstrated the ability to verbally imitate the oral presentation of each word.

Performance statement

The learner will

(a) either pronounce each word directly while complying with the following standards, or
(b) perform a phonetic analysis on the letters until the correct pronunciation is achieved, then restate the word complying with the following standards.

Standards statement

(a) each word must be read correctly in < 6 seconds
(b) three errors may occur with no more than one error per category as described in a-d in the conditions
(c) in the final pronunciation of each word, appropriate sounds must be given to:
—long and short vowels
—single consonants
—digraphs and diphthongs
silent letters must not be sounded.

(d) the test must be repeated 3 times with different sets of words after successively longer periods of time following initial instruction: 4 days; 8 days; 16 days.

Task analysis. A task analysis involves an analysis of the performance of a number of novice and accomplished performers under a variety of naturally occurring conditions. The analysis has several purposes. The performance analysis is designed to (a) identify common errors made by novice performers so as to design instructions to avoid these errors, and to (b) identify various methods by which accomplished performers complete the task, for the purpose of selecting the simplest method. The conditions analysis is designed to indicate (a) the most difficult commonly found conditions, and (b) the usual range of influential conditions for the purpose of teaching the learner to respond appropriately to these conditions during instruction. The purpose of the standards analysis is to identify the minimum essential standards of performance required to perform in a normative manner in the least restrictive environment. The information obtained from these analyses is used to refine the instructional objective. In addition, the results of the conditions and performance analyses are summarized in a flowchart as in Figure 5.2. The rectangular shapes indicate the sequence of steps involved in performing the reading task described in the instructional objective. The diamond shapes indicate the occurrence of various conditions: (a) long, short or silent vowels, or vowel digraphs, (b) consonants or consonant digraphs, and (c) various letter combinations: cvc, vcv, ccv, and cvv. The flowchart illustrates the influence of each type of condition upon the performance. Several flowcharts may be developed and analysed to determine the simplest method of performing the task.

Enabling skills analysis. Following selection of the simplest method of performing the task, an enabling skills analysis is conducted to determine what skills a learner will require to be able to perform each step in the task. The analysis is conducted

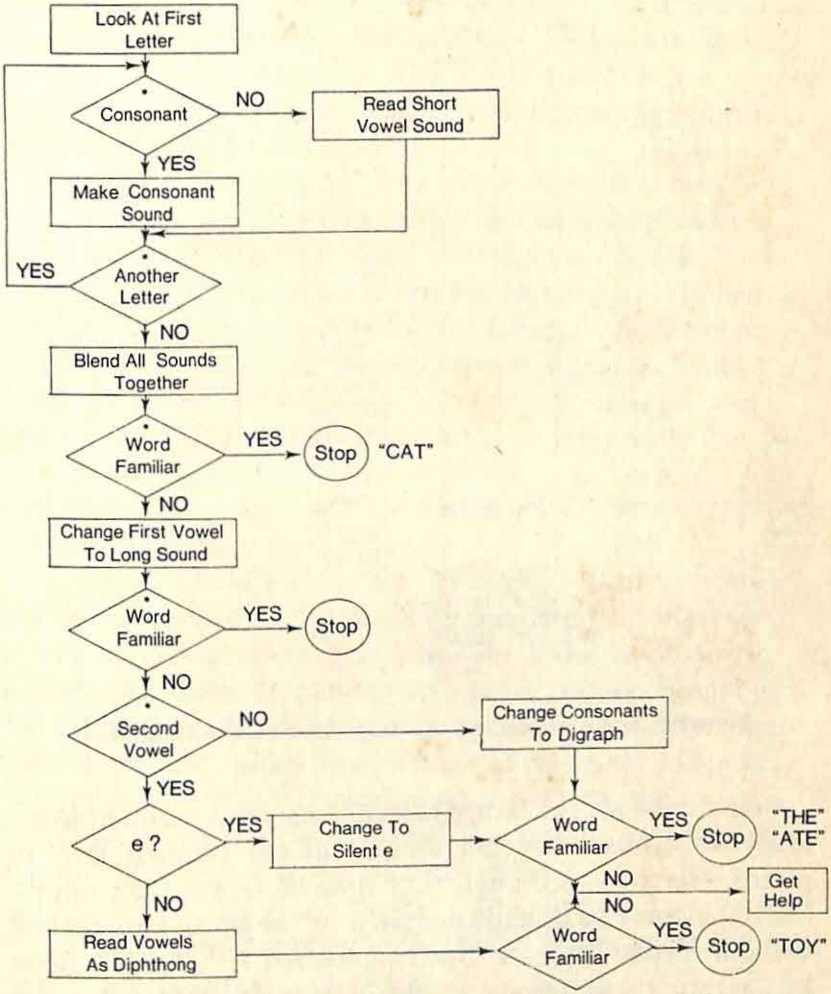


Figure 5.2. Flowchart summarizing conditions and, performance analyses

in the following manner: the steps in the flowchart are collapsed onto the ridgeline of a lattice as in Figure 5.3; refer to steps numbers 1, 2, 3 ... 6. Each step is then analysed into enabling skills; refer to a, b, c . . . under the steps. The analysis into subskills is performed on the basis of (a) a logical analysis, (b) empirical evidence, (c) a theoretical model, and/or (d) Gagne's taxonomy (discussed below).

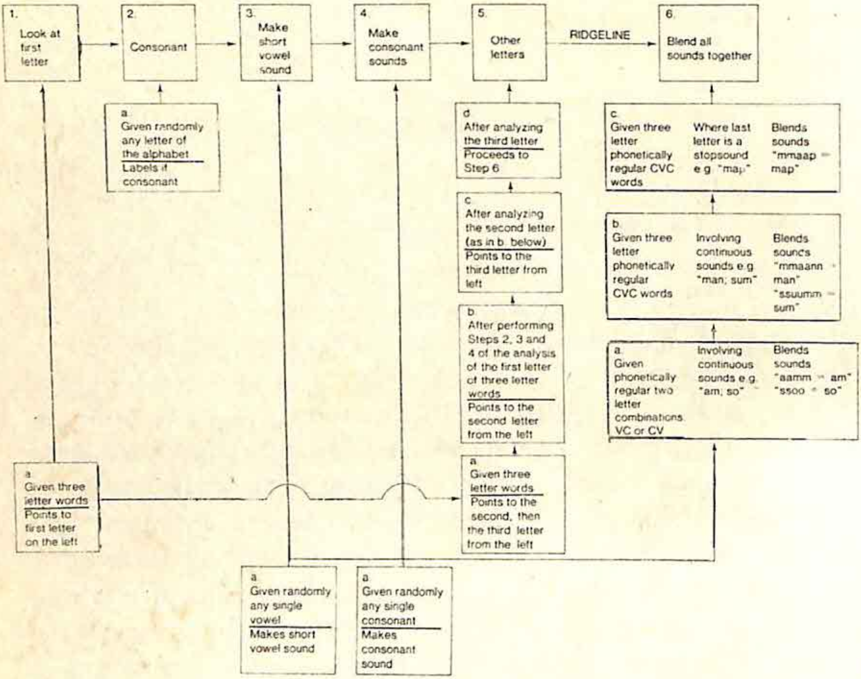

1.
Look at first letter
2.
Consonant
3.
Make short vowel sound
4.
Make consonant sounds
5.
Other letters
RIDGELINE
6.
Blend all sounds together
a
Given randomly any letter of the alphabet
Labels if consonant
d
After analyzing the third letter
Proceeds to Step 6
c
After analyzing the second letter (as in b. below)
Points to the third letter from left
b
After performing Steps 2, 3 and 4 of the analysis of the first letter of three letter words
Points to the second letter from the left
a
Given three letter words
Points to the second, then the third letter from the left
c
Given three letter phonetically regular CVC words
Where last letter is a stopsound e.g. "map"
Blends sounds "mmaap = map"
b
Given three letter phonetically regular CVC words
Involving continuous sounds e.g. "man; sum"
Blends sounds "mmaann = man" "ssuumm = sum"
a
Given phonetically regular two letter combinations VC or CV
Involving continuous sounds e.g. "am; so"
Blends sounds "aamm = am" "ssoo = so"
a
Given three letter words
Points to first letter on the left
a
Given randomly any single vowel
Makes short vowel sound
a
Given randomly any single consonant
Makes consonant sound

Figure 5.3. Lattice showing ridgeline and enabling skills

Some steps on the lattice ridgeline may not require further analysis because they are already at the simplest level of performance, or, although they may be at a more complex level, they may be directly acquired by the learner population without further analysis. Steps numbered 1, 2, 3 and 4 are of this nature; these steps have merely been rewritten in the form of abbreviated enabling instructional objectives. A review of the enabling skills indicates that skill 2a is redundant with steps 3 and 4; it is unnecessary for a student to indicate whether a letter is a vowel or a consonant; he should merely make the appropriate vowel or consonant sound when presented with any letter of the alphabet.

Gagne's taxonomy. Gagne (1977) has developed a hierarchical method for classifying and analysing learning tasks. An interpretation of Gagne's hierarchy is described in the following paragraphs. The hierarchy is used in the present context, first, to determine whether to perform a concept analysis or a task analysis, second, as a means of performing the enabling skills analysis.

A *stimulus–response link* involves a single link between a stimulus and a response. The occurrence of a simple stimulus (S) and response (R) link such as S= 'light on' and R='lever press' is rare. Compound sets of stimuli and responses joined by a single link are more common; for example, S_1 the teacher presents S_2 a spoon and says S_3 "point to spoon," and the learner R_1 raises his/her arm, R_2 extends his/her finger, and R_3 points to the spoon. Compound stimuli and responses that are joined by a single link and can be taught or performed as one continuous act with undifferentiated parts are defined as stimulus–response links.

A *chain* comprises a set of verbal and/or motor stimulus–response links (a series of alternating discriminative stimuli and responses) performed in a fixed order. For example, the chain: (1) picking up a spoon, (2) scooping food, and (3) putting the food in one's mouth, involves three stimulus–response links. The presence of the spoon and food is a stimulus–response—(1) picking up the spoon; the spoon in the hand is a stimulus for response, (2) scooping food, and the food on the spoon is a stimuls for response, (3) putting the food in one's mouth. A chain consists of a number of responses that initially must be individually taught before being linked together into a continuous chain.

Simple *discriminations* involve distinguishing one or more identical objects (e.g., the letter 'n') from one or more objects (e.g., the other letters of the alphabet). The objects (letters) from which 'n' is discriminated may be: (1) identical to each other (e.g., s, s, & s), or (2) different from each other (e.g., s, g, & a); as well as (3) similar to 'n' (e.g., r, m, u, & h) or dissimilar to 'n' (e.g., s, d, & e). Multiple discriminations involve distinguishing two or more objects (e.g., the letters n & a) from one or more other objects (letters). One consistent S-R link or chain such as pointing, labelling, or selecting is made to indicate each type of discrimination. Discriminations involve learning the discriminative features or essential characteristics of stimulus objects such as colour, shape, texture, loudness, brightness, and/or orientation.

The learning of *concrete concepts* involves the classification of (by pointing to, or naming) one or more familiar and unfamiliar objects that are within the same class. Objects within the same class are similar (have different nondiscriminative or irrelevant characteristics). Classification involves discrimination of objects within a class from objects outside the class, and generalization of a response (classification) to similar, previously unencountered members within the class. For example, concept learning involves the classification of (e.g., by selectively pointing to) a variety of different dogs, some previously unencountered (involves generalization), among several objects similar to dogs (involves discrimination). A learner who indicates that he/she can discriminate the features of a fox terrier, chihuahua, and wolfhound by selectively pointing only to these animals, indicates that he/she has learned the 'concept of dog' by generalizing his/her selective pointing response to previsouly unencountered members of the class such as a whippet, German shephard, and pekingese.

Rules are statements about the relationship between two or more concepts. A learner is considered to have acquired a rule when he/she has demonstrated its application. Simple recitation of a rule provides evidence of having learned a verbal chain rather than rule application. For example, the rule "keys open locks" is a statement describing the relationship between three concepts: keys, open, and locks. To fully demonstrate application of this rule, a learner must (1) identify (select) a variety of keys from among a number of objects that are not keys; (2) identify a variety of locks from among a number of objects that are not locks; (3) match keys to locks; (4) identify open and closed locks; and (5) orient, insert, and turn the keys to open the locks.

Problem solving is demonstrated when a learner discovers a combination of two or more previously learned rules to solve an unfamiliar problem. The solution to the problem is discovered or invented, and the combination of rules produces a higher-order rule or problem-solving strategy that subsequently can be used to obtain the solution to similar problems. An example of problem solving is demonstrated when an individual discovers that the two rules: (1) keys open locks; and (2) striking an object may dislodge it from a fixed position, can be combined to solve the previously unencountered problem of a lock with a jammed bolt. Neither rule in isolation will solve the problem.

Scope and sequence chart

When all the enabling skills within the lattice that may exist among the skills have been identified, the skills are listed into instructional sequences or strands. The enabling skills in the lattice displayed in Figure 5.3 may be organized into the following three strands:

1. letter–sound correspondence enabling skills: 4a & 3a.
2. sequential analysis enabling skills: 1a, 5a, 5b, 5c, & 5d.
3. blending: 6a, 6b & 6c.

	INSTRUCTIONAL PHASE					
STRAND	A	B	C	D	E	F
1. letter–sound correspondence	4a	3a				
2. sequential analysis	1a	5a	5b	5c		5d
3. blending			6a	6b	6c	

Figure 5.4. Scope and sequence chart

Some of these skills may be taught concurrently, whereas other skills may be prerequisite to skills that are taught later.

TABLE 5.1: *Sequence of instructional events within a lesson*

Phase	Activity	Purpose	Pace	Duration	Rate of reinforcement
1. (a) Rehearsal and/or	Review of previously learned skills which are components of, or prerequisite to, the next skill to be taught (e.g., review of skills in hierarchy).	— Warm-up; bring skills back to competency level; transition from previous activity (e.g., gym); establish learning set (sitting and attending).	Fast		Intermittent (e.g., VR: 3-5) (verbal)
(b) Pretraining	Pretrain difficult S-R links in the next chain to be taught. Teach new object label for later discrimination.	— Facilitate rapid and smooth sequencing of S-R links in the next chain to be learned. Teach first step in a discrimination.	Medium	Total (3-5)	Continuous (verbal)

2. (a) Acquisition	Teaching a new S-R link, chain, discrimination, or concept. Include group instruction, and group and individual testing.	— Incorporation of previously learned skills. — Removal of instructional assistance. — Achieve and maintain at least 85 per cent accuracy.	Slow		Continuous (verbal plus)
(b) Generalization	Introduction of skills learned in previous lessons to variations in context, control figures, and performance cues. Includes group instruction, and group and individual testing.	— Teach learner to perform under most difficult, commonly found conditions. — Teach learner to cope with usual variations of conditions. — Removal of instructional assistance. — Achieve and maintain at least 85 per cent accuracy.	Slow	Total (10-12)	Continuous (verbal plus)
3. Maintenance	Review one or more skills taught in previous lessons. Use various 'game' formats.	Maintain previous learning by review after successively longer periods of time.	Fast	(4-6)	Intermittent infrequent (verbal only)
4. Review	Review skills and/or generalizations taught earlier in this lesson.	Maintain recent learning and generalization through review.	Slow	(6-8)	Continuous (verbal and occasional plus)

The interrelationship between these skills is displayed in a scope and sequence chart as in Figure 5.4. The enabling skills 4a and 1a may be taught concurrently during instructional phase A.

Two or more skills at different stages of instruction: acquisition, maintenance and generalization may be included in a single lesson. Table 5.1 describes the manner in which these skills may be organized within a lesson.

Integrate Instructional methods and materials

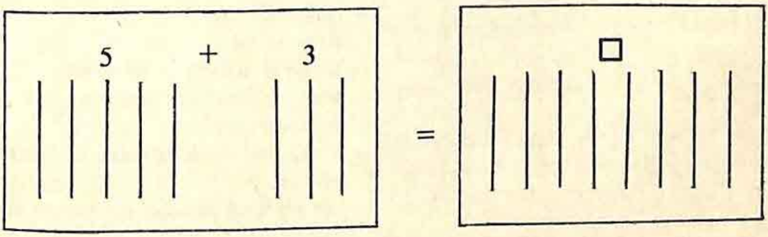
The following organization of the skills, suitable instructional methods and materials are selected. Some examples of various instructional techniques follow:

1. Prompting and fading: modelling, gesturing, leading, verbal instruction, manual signalling, physical guidance, as well as within- and extra-stimulus prompting.
2. Task sequencing: forward and reverse, cumulative and successive chaining, and shaping.
3. Practice: massed and distributed practice, overcorrection, overlearning, and precorrection.
4. Direct instruction (see the example that follows).
5. Correction procedures (see the list that follows).
6. Generalization techniques: sequential modification, environmental variation during acquisition; variations in amount, type and frequency of reinforcement, prompting attention to discriminative stimuli, and training self-evaluation.

The following sequence shows a direct instructional procedure applied to the teaching of addition. The sequence is described in Silbert, Carnine and Stein (1981), *Direct Instruction Mathematics.*

Direct instructional board presentation

Step	Teacher	Students
	Write on board: 5 + 3 = ☐	
1.	"READ THE PROBLEM."	"5 + 3 = how many?"
2.	Point to the equal sign.	
	"WHAT IS THIS?"	"Equal"
3.	"LISTEN TO THE EQUAL RULE: WE MUST END WITH THE SAME NUMBER ON THIS SIDE OF THE EQUAL (circle 5 + 3) AND ON THE OTHER SIDE" (box).	
4.	Point to 5.	
	"HOW MANY IN THE FIRST GROUP?"	"5"
5.	Point to + 3.	
	"THIS SAYS PLUS THREE. PLUS TELLS US TO DRAW MORE LINES, SO I DRAW THE LINES."	"1, 2, 3,"
	Draw three lines.	
6.	"WE'VE DRAWN ALL THE LINES ON THIS SIDE. LET'S COUNT AND SEE WHAT WE END WITH. COUNT AS I TOUCH THE LINES."	"1, 2, 3, 4, 5, 6, 7, 8" "8"
	Touch lines.	
7.	Point to 5 + 3.	
	"WE ENDED WITH 8 ON THIS SIDE, SO WHAT NUMBER MUST WE END WITH ON THE OTHER SIDE?"	"8"
	"I'LL DRAW THE LINES. YOU COUNT AND TELL ME WHEN TO STOP."	"1, 2, 3, 4, 5, 6, 7, 8 stop"
	Draw lines under box.	



TO CORRECT: If children don't say stop after 8, keep drawing lines, then say, "WE MADE A MISTAKE, YOU HAVE TO TELL ME TO STOP." Repeat from step 6.

Step	Teacher	Students
8.	"THE LINES UNDER A BOX TELL WHAT NUMERAL GOES IN THE BOX. HOW MANY LINES ARE UNDER THE BOX?"	"8"
	"SO WHAT NUMBER GOES IN THE BOX?" Write 8 in the box.	"8"
	"WHAT DOES 5 + 3 EQUAL?"	"8"
9.	"SAY THE WHOLE STATEMENT."	"5 + 3 = 8"
10.	Repeat steps 1-9 until students can answer with no errors. Repeat steps 1-9 with several problems.	

Direct instruction correction procedure

Types of error	Correction procedure
1. Orientation error	
(a) failure to respond	— increase salience (intensity or visibility of readiness signal, and/or focusing prompt, and/or stimulus material — introduce 'orientation training'; consequate appropriate orientation to a readiness signal — employ prompts: gestural, physical and/or within- or extra-stimulus prompts
(b) resists orienting (has previously frequently and recently demonstrated appropriate response to the same stimuli)	— evaluate instructional variables: — duration of instruction — number of trials — pace — competing reinforcers — task difficulty — reinforcement — previous activity in schedule — time-out (evaluate negative reinforcement) — if negative reinforcement, use paced practice — use physical prompt and mandate

Types of error	Correction procedure
(c) orients to wrong part of stimulus	— use teacher prompts: verbal, gestural modelling, physical — use stimulus prompting: within or extra stimulus — reduce stimulus value of distracting parts of stimuli — use interception: "No!" with prompt — use precorrection — overcorrect
(d) becomes distracted during instruction	— temporarily reduce distracting stimuli and slowly reintroduce — examine instructional variables as in (b) above — use interception and a prompt
2. latency errors (responds too quickly or slowly to task command)	— if too quickly (a) intercept, "No!" "WAIT UNTIL I(TC)", and repeat, (b) prevent the response until the TC is given, (c) positive practice (avoid inadvertent reinforcement), (d) mandate — if too slowly (a) physically prompt, (b) shape — overcorrect
3. right type of response but wrong response of that type (e.g., points to [correct response] wrong object)	— "No!" (repeat TC) "POINT TO X." (and model the correct response); if imitation is not in repertoire, or if model unsuccessful, repeat TC and physically prompt — intercept "No!" "POINT TO X." — increase discriminative features of stimuli, if a discrimination is required — decrease nondiscriminative features of stimuli — increase the differences between the stimuli being selected — precorrect: focus on discriminative aspects of the stimuli — overcorrect
4. wrong type of response (touches rather than picks up)	— "No! (repeat TC) — model or physically prompt correct response — precorrect response to TC — overcorrect
5. response bias errors (in discrimination task repeatedly and consistently makes a wrong	— consistently make another colour or location (as appropriate) the correct response, then randomize

Types of error	Correction procedure
choice on the basis of a nondiscriminative feature such as colour or location)	— model; physically prompt and reinforce the correct response — avoid inadvertent increase in reinforcement (teacher trap)

During the development of a programme, a formative evaluation of the effectiveness of each phase of instruction is conducted. Following completion of the programme a summative evaluation is performed in which the programme is compared with other programme teaching the same skills. Methods of formative and summative evaluation are described by Baine (1982).

Concept analysis and sequencing

If it is observed that, according to Gagne's hierarchy, the instructional objective contains discriminations, concepts, rules and/or problem solving, then, as indicated in Figure 5.1, a concept analysis is conducted. Generally and briefly described, a concept analysis involves the following steps:

1. Define the set of objects, events or symbols (examples) that comprise the set.
2. Identify the *discriminative* features common to all examples.
3. Determine the *non*-discriminative features shared by some but not all the examples.
4. Define the *range* of examples within the set.
5. Identify examples that define the *boundaries* and *midpoint* of the range of examples.
6. Identify *non*-examples that border on the boundaries of the range of examples. These are non-examples that share with examples one or more than one, but not all, of the discriminative features, and that may have non-

discriminative features in common with non-examples.
7. Select a number of non-examples to represent their range.

Instructional sequencing of concepts involves the following steps in which two or more examples are presented simultaneously:

1. Remove as many non-discriminative (ND) features as possible from all examples (E) and non-examples (NE).
2. Where ND features remain, hold them constant in all Es and NEs.
3. If required, decrease the salience of ND features, and increase the salience of D features.
4. To focus learner attention on a discriminative (D) feaure, pair Es and NEs that are different only with respect to one D feature.
5. Introduce the learner to all D features in this manner.
6. Sample the range of values of each discriminative features.
7. Reintroduce the ND features one at a time to both Es and NEs; first between, then within, successive pairs.
8. Sample the range of values of various ND features.
9. Return the ND features to normal intensity.
10. Return the D features to normal intensity.

Some instructional techniques for teaching concepts are described below:

1. Deductive methods in which synonyms or definitions are used.
2. Inductive methods employing modelling.
3. Simultaneous presentation of examples and non-examples.
4. Within stimulus prompting.
5. Pretraining focus on discriminative features.

A more detailed description of concept analysis, sequencing and teaching may be found in Baine (1982). The following sequence provides an illustration of the application of direct instruction to teaching a rule. The example is taken from Morphographic Spelling (Dixon, 1976). The 'signal' is used in the teaching sequence to orchestrate simultaneous response from a group of students.

LESSON 1

Exercise 1: Word rule

NOTE: (Repeat until firm) means to repeat the indicated task until all students are responding correctly and on signal. When in doubt about any single student's response, give an individual turn.

(a) LISTEN: ALL WORDS ARE MADE UP OF MORPHOGRAPHS. SOME WORDS ARE MADE UP OF ONE MORPHOGRAPH. SOME WORDS ARE MADE UP OF MORE THAN ONE MORPHOGRAPH.
REMEMBER: ALL WORDS ARE MADE UP OF MORPHOGRAPHS.

(b) IF IT IS A WORD, WHAT DO YOU KNOW ABOUT IT?
(Signal.) "It is made up of morphographs."

To correct:
1. IT IS MADE UP OF MORPHOGRAPHS.
2. (Repeat step b until firm).

(c) IF IT IS NOT A WORD, WHAT DO YOU KNOW ABOUT IT?
(Signal.) "It is not made up of morphographs."
(Repeat until firm).

(d) (Write orn on the board. Point to orn.)
READ THIS.
(Signal.) "orn."
IS ORN A WORD?
(Signal.) "No."

To correct:
1. ORN IS NOT A WORD.
2. (Repeat step d.)

ORN IS NOT A WORD, SO WHAT DO YOU KNOW ABOUT IT?
(Signal.) "It is not made up of morphographs."

To correct:
1. IT IS NOT MADE UP OF MORPHOGRAPHS.
2. (Repeat step d.)

(e) (Change orn to gorn. Point to gorn.)
READ THIS.

(Signal.) "gorn."
IS GORN A WORD?
(Signal.) "No."
GORN IS NOT A WORD, SO WHAT DO YOU KNOW ABOUT IT?
(Signal.) "It is not made up of morphographs."

(f) (Change gorn to born. Point to born.)
READ THIS.
(Signal.) "born."
IS BORN A WORD?
(Signal.) "Yes."
BORN IS A WORD, SO WHAT DO YOU KNOW ABOUT IT?
(Signal.) "It is made up of morphographs."

(g) (Change born to reborn. Point to reborn.)
READ THIS.
(Signal.) "reborn."
IS REBORN A WORD?
(Signal.) "Yes."
REBORN IS A WORD, SO WHAT DO YOU KNOW ABOUT IT?
(Signal.) "It is made up of morphographs."

(h) (Change reborn to rebo. Point to rebo.)
READ THIS.
(Signal.) "rebo."
IS REBO A WORD?
(Signal.) "No."
REBO IS NOT A WORD, SO WHAT DO YOU KNOW ABOUT IT?
(Signal.) "It is not made up of morphographs."

(i) (Change rebo to box. Point to box.)
READ THIS.
(Signal.) "box."
IS BOX A WORD?
(Signal.) "Yes."
BOX IS A WORD, SO WHAT DO YOU KNOW ABOUT IT?
(Signal.) "It is made up of morphographs."

Exercise 2: Morphographic rule

NOW WE'LL LEARN A RULE ABOUT ALL MORPHOGRAPHS IN A WORD.

(a) LISTEN: ALL MORPHOGRAPHS HAVE A MEANING.
(Repeat the rule)

(b) WHAT'S THE RULE ABOUT ALL MORPHOGRAPHS IN A WORD?
(Signal.) "All morphographs have a meaning."

(c) AGAIN, WHAT'S THE RULE?
(Signal.) "All morphogrphs have a meaning."
(Repeat step C until firm.)

Exercise 3: Affix introduction

NOTE: Pause two seconds at every colon (:). For example the procedure in step e is IN THIS WORD, RE MEANS: (Pause) AGAIN.

(a) (Write repack on the board.)
READ THIS.
(Signal.) "repack."
IS REPACK A WORD?
(Signal.) "Yes."

(b) REPACK IS A WORD, SO WHAT DO YOU KNOW ABOUT IT?
(Signal.) "It is made up of morphographs."

To correct:
1. IT IS MADE UP OF MORPHOGRAPHS.
2. [Repeat step (b) until firm.]

(c) WHAT IS THE RULE ABOUT ALL MORPHOGRAPHS IN A WORD?
(Signal.) "All morphographs have a meaning."

(d) (Underline re.)
RE IS A MORPHOGRAPH IN THIS WORD. SO WHAT DO YOU KNOW ABOUT RE?
(Signal.) "It has a meaning."

To correct:
[Repeat steps (c) and d.]

(e) IN THIS WORD, RE MEANS: AGAIN. WHAT DOES RE MEAN?
(Signal.) "Again...."
SPELL RE. GET READY.
(Signal.) "r-e."

(f) WHAT MORPHOGRAPHS MEANS: AGAIN?
(Signal.) "re."
SO WHAT WORD MEANS: PACK AGAIN?
(Signal.) "repack."

To correct:
1. REPACK
2. [Repeat step (f).]

(g) WHAT MORPHOGRAPH MEANS: AGAIN?
(Signal.) "re."
SO WHAT WORD MEANS: COLOUR AGAIN?
(Signal.) "recolour."

(h) WHAT MORPHOGRAPHS MEANS: AGAIN?
(Signal.) "re."
SO WHAT WORD MEANS: BORN AGAIN?
(Signal.) "reborn."

CHAPTER 6

Direct Instruction: Reading

This chapter provides a brief introductory summary of the techniques described by Carnine and Silbert (1979) in their textbook entitled *Direct Instruction Reading*. In the text, the authors provide a comprehensive and detailed description of specific direct instructional techniques for teaching reading skills from the introductory stages to grade eight. The textbook has been written for preservice and inservice, regular and special education teachers, reading specialists and programme designers. The instructional methods described are generally suitable for students who may be instructionally sophisticated, normal functioning, handicapped, bilingual, or economically disadvantaged. The methods are particularly suitable for 'hard-to-teach' students. The authors discuss: (a) various methods for teaching each of the reading skills, (b) the authors' theoretical and/or empirical basis for selecting one or more of the methods, (c) a detailed illustration of application of each method, (d) diagnostic, corrective and motivational techniques, and (e) methods of commercial materials review and selection.

The direct instructional approach has several characteristics:

1. Complex skills are analysed into their components.
2. Rather than rely on rote learning, students are taught problem-solving strategies that may be generalized to find the solution to untaught problems.
3. Specially designed procedures and formats are developed to each problem-solving strategy. Each instructional

format describes exactly what, when and how a teacher is to employ a particular set of instructional procedures and materials.

4. The skills to be taught in a programme are ordered into an instructional sequence incorporating:
   (a) preselected examples and nonexamples used to teach a particular skill or concept;
   (b) massed and distributed practice to facilitate acquisition, generalization, and maintenance of learning; and
   (c) techniques of prompting and fading.
5. Small group instruction methods involve:
   (a) selection and organization of homogeneous groups;
   (b) orchestration of choral responding;
   (c) monitoring group and individual responses;
   (d) group and individual testing; and
   (e) correction and reinforcement procedures.

Direct instructional techniques have been successfully used in *Distar Reading, I* and *II* (Engelmann and Bruner, 1974 and 1975), *Distar Reading, III* (Engelmann and Stearns, 1973), *Distar Language, I* and *II* (Engelmann and Osborne, 1976 and 1977), *Distar Arithmetic I* (Engelmann and Carnine, 1975), *Morphographic Spelling* (Dixon, 1976), and *Corrective Reading* (Engelmann, Becker and Carnine, 1976). The Distar programmes were extensively evaluated during a ten-year study in the United States in the programme *Follow Through*, in which a comparison was made of several major approaches designed to educate low income, primary grade students. The instructional approaches studies were direct instruction, language experience, Piegetian, child development theory, discovery learning and open education. Only students in the direct instruction approach consistently outperformed control students on basic cognitive and affective measures (Becker, Engelmann and Carnine, 1976; Carnine, 1979). The direct instructional approach has relatively strong theoretical and empirical support.

Carnine and Silbert describe generic direct instructional procedures that may be used in conjunction with any commercial, code-based reading programme. Methods of selecting, modifying and applying commercial programmes are also described.

The authors make the following general recommendations regarding reading instruction:

1. During the early grades (K-2) the majority of instruction should be conducted in a small, highly structured group that permits the teacher to monitor student performance closely, while providing correction or reinforcement directly following a response. During intermediate grades, students performing at or above grade level may benefit from more loosely structured, student-centred activities. Students performing below grade level may still require a more structured approach.
2. Teachers should endeavour to present instruction in a manner in which students can maintain a success rate of 90% or higher correct responses.
3. Instruction should be rapidly paced to hold student attention. Fast pacing, however, does not mean rushing. Sufficient time must be allotted for students to prepare each response, while the time between completion of one response and beginning directions for the next is minimized. Research evidence indicates that with rapidly paced instruction (5 seconds/task; 12/minute) off-task behaviour is reduced, while attention and the proportion of correct responses is increased. A teacher may work intensively for 5 minutes, then take a 15-second break during which time student efforts are praised. A thirty-minute session would include five smaller sessions.
4. The more deficient a student is, the greater the amount of instruction he/she should receive. A student should receive an extra 15-30 minutes each day of direct instruction for each year he/she is below grade level.
5. The more deficient a student is in reading, the more quickly

he/she must progress through the remedial programme to catch up with peers. A student behind in achievement must progress at a rate of more than one year for each year of instruction. Thus, programmes must teach all the essential skills in the most efficient manner.

6. Teachers must ensure that low performing students have the basic vocabulary and language skills to comprehend the meaning of words encountered in reading material and in teacher instruction.

Where required, instruction must be provided in basic oral language and vocabulary. Students should initially be taught to repeat sentences presented orally, and answer simple questions. Statement repetition is a preskill for learning definitions and answering questions about statements. If students have difficulty in saying a statement to themselves, they are likely to have difficulty in understanding the sentence and answering quetions about it. Statement repetition should be tested during the first week of school with sentences having 6-10 words.

Sentence comprehension begins with exercises designed to teach students to identify what happened in an orally presented sentence. Students are asked to say *who* was involved, *when* the event occurred, *where* the event took place, and *why* the event occurred.

The students should be able to repeat 5-7 word statements before questions are introduced. Questions are introduced in the following order from the least to the most difficult; e.g., *Who* went to the store?, *What* did John do at the store?, *Where* did John go?, *When*?, *How*?, and *Why*?

Vocabulary is taught by three methods:

(a) Synonyms are used when a student knows a word or words with equivalent meaning. For example, if a student knows the word *over*, but does not know *above*, the teacher may tell the student that *above* means *over*. The student is then tested for his/her understanding of *above*, when the teacher presents examples and nonexamples of *above* and the student is asked to identify them.

(b) Definitions are used when students have adequate vocabulary to understand a definition and when a concept is too complicated to be explained by a synonym. For example, a service station may be defined as a place where cars are fuelled and repaired.

(c) A modelling (inductive) approach is used when students do not have sufficient vocabulary to permit the use of synonyms and definitions. For example, a teacher may present examples and nonexamples of a concept, "This crayon is brown; This crayon is not brown." The student is then presented with crayons that are brown and those that are not brown, and is asked to identify the brown crayons.

Carnine and Silbert provide a detailed description of the appropriate manner of using each of these approaches.

The act of reading involves two processes: decoding and comprehension.

Decoding

Decoding is the translation of printed words into a representation similar to oral language, e.g., reading, either silently or aloud, "I am hot," for the words *I am hot*. Comprehension is knowing who *I* in the sentence refers to and what *being hot* feels like. There are many different theories and methods associated with teaching decoding and comprehension. The model of decoding and comprehension used by Carnine and Silbert has the following characteristics:

1. A phonics approach is used in which students are taught to identify increasingly larger units of letters—beginning with individual letters, then letter clusters, words, and, finally, phrases.
2. Students are taught to manipulate units of letters of various sizes through blending, segmenting or substituting, to decode a word.

3. Methods are taught of structural analysis for decoding multisyllabic words through recognition of root words, prefixes and suffixes.
4. Contextual analysis is taught in which syntax and semantics are used as aids to decoding.

Several issues surround the teaching of reading. The authors have adopted the following approach to each issue:

Letter sounds vs. letter names. Letter sounds are taught before letter names as the former have more resemblance to the sounds made in spoken words, and are, therefore, more useful than letter names in initial decoding.

Code emphasis vs. meaning emphasis. Code emphasis programmes emphasize letter–sound regularity. These programmes initially select words made up of letters and letter combinations that represent the same sound in different words. The consistency between letters and sounds enables a student to read many different words by blending the sounds for each new word. A new word is not introduced until students have mastered the letter–sound correspondence making up the word.

Meaning emphasis approaches stress the use of common words. In this approach, words are selected that appear frequently in print. The assumption is that frequently appearing words are familiar and, therefore, easier for students to learn to read. Students are encouraged to use a variety of sources such as pictures, context clues, word-configuration and initial letters as cues to decoding. This type of programme does not control words so that the same letter represents the same sound in most initially appearing words. The approach is characterized by language experience and individualized reading programmes.

Carnine and Silbert recommend a code emphasis approach because it lends itself to highly controlled and consistent instructional sequences that lead to early success for most learners. The approach also permits a teacher to readily diagnose and correct decoding errors.

Sounding-out vs. sight-word reading. Carnine and Silbert initially employ a sounding-out approach to reading. Sounding-out is a relatively easily learned strategy that can be generalized to the decoding of new words. Later, irregular words are learned as sight-words. However, students are taught to carefully attend to each letter in the words so as to discriminate words that differ in some minor but significant way, e.g., from-form.

Words in isolation or in context. The authors recommend using words initially in lists rather than in the context of a sentence or passage. Words in isolation force the student to attend to the letters and letter combinations rather than to the context and picture cues to decode a word. Premature use of the context and picture cues leads to the development of ineffective decoding strategies. After words have been introduced in isolation, regular words and high-frequency irregular words are introduced in the context. In fact, some words must be introduced in the context because of their dual pronunciation and meaning, e.g., *lead* as in *lead pipe*, and *lead* as in *lead the way*.

Accuracy vs. fluency. During initial reading excercises, instruction focuses on the accuracy of decoding rather than fluent (rapid and expressive) reading. The rationale for this approach is that premature focus on fluency leads to careless decoding and guessing at words that make sense in the context. On the other hand, a prolonged focus on decoding without increasing fluency leads to word-by-word reading and a reduction in comprehension. Thus, following the initial focus on decoding, fluency is gradually introduced as proficiency in decoding increases..

Oral vs. silent reading. Oral reading is used exclusively during initial instruction as it permits ease of performance monitoring and rapid correction or reinforcement as required. However, since silent reading is the ultimate goal, mid and late primary students should read silently most of the time. At that stage, oral reading is used only when new reading skills are being taught or when evaluating student decoding skills. While oral reading does not interfere with reading rate and comprehension during early instruction, it could interfere at a later stage, if ample practice in silent reading is not provided.

Comprehension

According to the authors, comprehension involves three processes which, although they may be taught independently, must operate simultaneously during reading comprehension.

1. One must learn to process increasingly more complex units of communication: words, phrases, sentences, paragraphs, and passages.
2. The reader must process the information through:
    - (a) rapid decoding;
    - (b) identification of literal information;
    - (c) summarizing;
    - (d) transferring complex syntax into simpler forms;
    - (e) drawing inferences;
    - (f) translating difficult vocabulary into familiar synonyms; and
    - (g) using various study skills such as outlining and skimming.
3. At the same time, the reader must apply knowledge about syntax, semantics, logic and factual information to make sense out of what was read.

Initial comprehension exercises involve simple picture–word matching. Later, the units of comprehension expand to phrases, sentences, paragraphs and passages, in which the student is initially asked to answer questions such as who, what, when, where and how, when the answers are based on specific details explicitly stated in the paragraph.

When literal items become more difficult, as sentence structure becomes more complex, students are taught to simplify syntactically complex sentences. Students are given exercises in (a) summarizing a passage, selecting the best title, the main idea, (b) sequencing events in a passage according to the order in which they occurred, and (c) drawing inferences, answering questions that are based on information in the passage but are not answered directly by the content of the passage. Vocabulary-related exercises are also included and students are taught antonyms, synonyms and classification.

Instructional sequence of reading skills

The sequence of reading skills taught from the beginning stages to the third grade are briefly listed below. It is to be noted that although the skills are listed, the teaching of various skills may overlap, at points, the teaching of other skills. The point at which each skill is introduced has been indicated, and the interdependence of each of the skills is apparent.

1. Students are taught the auditory skills required for analysing and synthesizing the sounds heard in spoken words.
2. Rhyming is taught as a method of showing the relationship between letter clusters such as *it, sit,* and *fit*.
3. Letter–sound correspondence is taught. The most common sounds of the most useful letters are taught first.
4. Regular words are introduced in which each letter represents its most common sound. Regular words are introduced when students have learned the most common sounds of 4-6 letters, and the methods of applying the auditory skills of segmenting and telescoping to simple regular words. Regular words are introduced in the following order:

    (a) cvc words in which each sound is continuous, e.g., *man*
    (b) words in which there is a stop sound in the final position, e.g., *map*
    (c) words in which there is a stop sound in the initial position, e.g., *pal*

(d) words in which there are blends, e.g., *crop*.

5. Sight-reading of regular words is introduced as soon as students are proficient in sounding out vc and cvc words that begin with a continuous sound.

   Code-emphasis commercial programmes are introduced at this point.
6. Irregular words, the letter–sound correspondence of which the student does not know, are introduced. Examples of such words are *park* and *eat*. These words are introduced after students have achieved 90% accuracy (with only a three-second pause) in reading regular cvc words.
7. Passage reading is introduced as soon as students can decode enough words so that the teacher can present simple phrases.
8. The primary stage of phonics analysis involves teaching students: (a) the most common sounds of letters represented by several consecutive letters and letter combinations such as: *th, ar,* and *kn*, (b) a strategy to decode vc-e words in which the initial vowel represents its long sound, and the final -e is silent, and (c) minor sounds (less frequently used) of letters and letter combinations, as well as a strategy for trying these sounds, if a word pronounced with the most common sound does not make sense.

   The first letter combinations are introduced after students have learned the most common sounds of 15-20 single letters and when they can decode passages of regular words at a rate of about 30 words per minute.
9. Students are taught structural (morphemic) methods of decoding words by identifying prefixes, suffixes, and base words.
10. It is recommended that students should not be asked comprehension questions until after they can decode a passage with relative fluency. Laborious decoding may interfere with comprehension. For average and above average students, having no difficulty with decoding,

comprehension questions may be incorporated into the first reading of a passage. In contrast, instructionally naive students may need to reread a passage several times before they are asked comprehension questions.

Students are taught (a) to respond to who, what, when, where, and how questions, (b) pronouns, (c) sequencing, (d) inference, (e) direction following, (f) synonyms, (g) antonyms, and (h) classification.

Instructional procedures

The general instructional procedure used to teach most of the reading skills involves the following steps:

(a) The teacher models the correct response.
(b) The teacher leads the students in making the correct verbal response (the teacher makes the correct verbal response simultaneously with the students' verbal response).
(c) The teacher employs prompts such as hand signals, clapping, etc., to orchestrate a choral response by students.
(d) The teacher tests the ability of the group to make the correct response in the absence of leading.
(e) The teacher tests the ability of individual students to respond correctly.

Correct responses are reinforced and error responses are generally corrected in the follwing manner. Modification may be made of this general procedure to better suit particular circumstances.

(a) Students who have made the correct response are reinforced.
(b) The teacher models the correct response.
(c) Students are led to make the response until all of them respond correctly.
(d) The group is tested on its ability to respond correctly.

(e) Testing of the corrected response is alternated with testing of other responses until two consecutive correct responses are made.

(f) The corrected response is retested later in the day.

Format for sounding out

(Illustrated with the cvc word type)

Teacher	Students
Teacher writes on board: SAD, FIT, MAN, SAM,	
PART 1	
(Teacher models, leads and tests on two words.)	
1. Teacher states instructions.	
"WATCH. WHEN I TOUCH A LETTER, I'LL SAY ITS SOUND, I'LL KEEP SAYING THE SOUND UNTIL I TOUCH NEXT LETTER. I WON'T STOP BETWEEN SOUNDS."	
2. Teacher models sounding out the first word.	
"MY TURN TO SOUND OUT THIS WORD."	
Teacher touches under each letter that represents a continuous sound 1 to 1½ seconds and under letters that represent stop sounds for only an instant.	
"SSSAAD."	
3. Teacher leads students in sounding out the word. Teacher points to the left of the word.	
"GET READY TO SOUND OUT THIS WORD WITH ME."	"sssaaad"
Teacher touches under letters. The teacher sounds out the word with the students until they respond correctly. Then the teacher asks:	
"WHAT WORD?"	"Sad."
4. Teacher tests the students on the first word. Teacher points to the left of the word.	
"YOUR TURN. GET READY TO SOUND OUT THIS WORD BY YOURSELVES."	
Teacher touches under letters.	"sssaaad"
5. Teacher repeats steps 2, 3, and 4 with one more word.	

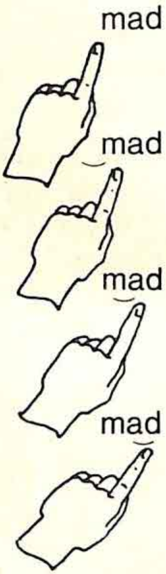
Teacher	Students
PART II	
(Teacher tests students on all the words.)	
1. "NOW YOU ARE GOING TO SOUND OUT ALL THE WORDS BY YOURSELVES."	
Teacher touches under each letter (except for stop sounds) for 1 to 1½ seconds.	Students say the sounds.
After the students correctly sound out the word, the teacher asks:	
"WHAT WORD?"	Students say the word.
2. Teacher repeats step 1 with the remaining words.	
3. Teacher repeats step 1 except at a faster rate (one letter each ½ second).	
4. Teacher gives individual turns, pointing at a rate of one letter each ½ second.	

Figure 6.1. Teaching format

Carnine and Silbert provide teaching formats illustrating exactly how to teach and correct each skill. The formats describe in what order the teacher is to do and say at each stage of instruction. Figures 6.1 and 6.2 provide an example of a teaching format and the associated hand signals. The discussion that follows provides only a brief review of the procedures, and the reader is referred to Carnine and Silbert's book for a more detailed description.

Auditory skills

Segmenting a word. The teacher says a word and the student breaks it into its component sounds. The student says each sound in the word for a second or two while moving from sound to sound without stopping, e.g. *am* becomes *aaammm*.



1. Instructions: Teacher points to the page about an inch to the left of the first letter in the word. "Get ready to sound out this word."
2. The signal for the first sound: Teacher looks at the students to see if they are attending, then quickly touches under the *m* for about 1 to 1 1/2 seconds.
3. The signal for second sound: Teacher *quickly* makes a loop, moving his finger from the first letter to the second letter, *a*, and holds his finger under *a* for about 1 to 1 1/2 seconds.
4. The signal for third sound: Teacher loops quickly from *a* to *d* and instantly removes his finger from the page. When signalling for the students to say a stop sound, the teacher touches under the letter for an instant and then moves his hand quickly away from the letter.

Figure 6.2. Signalling procedure

The skill (a) shows the student that words are composed of discrete sounds, (b) provides practice for later blending exercises, and (c) serves as a preskill for simple spelling in which the student hears a word, breaks it into its component sounds, and then writes each sound.

Telescoping sounds to form a word. The teacher says a series of blended sounds and the student translates the sounds into a word stated at the normal rate, e.g., *aaammm* becomes *am*. This skill prepares the student to identify words after having sounded them out. Telescoping sounds to form a word is easier than segmenting a word; telescoping is introduced first. The words used to teach these skills are phonetically regular words that appear in early word reading tasks. As soon as a student can say a word after hearing the sounds, segmenting is introduced.

These auditory skills continue to be taught until sounding out is introduced, at which point the skills are no longer separately taught as they are incorporated into the act of sounding out.

Letter–sound correspondence. Several considerations determine the order in which letters are introduced during letter–sound correspondence training.

(a) Initially, only the most common sound for each letter is introduced. This is the sound that is usually pronounced when the letter appears in a cvc word such as *sit*.
(b) Visually similar letters such as b and d, n and m, h and n, and/or auditorially similar letters such as f and v, t and d, p and k, are separated. Auditorially similar words are more difficult than visually similar words, while auditorially *and* visually similar words—b and d, m and n—are the most difficult.
(c) The most useful letters are introduced before those that are less useful, such as j, y, x, and q.
(d) Lower case (small) letters are introduced before upper case (capital) letters.

A new letter is introduced every 2 or 3 days providing that students are not having difficulty with previously introduced letters. The sequence of letter introduction, as suggested by Carnine and Silbert in compliance with the above recommendations, is as follows:

> a, m, t, s, i, f, d, r, o, g, l, h, u, c, b, n, T, L, M, F, k, v, e, p, D, I, N, A, R, H, G, B, w, J, Y, X, q, z, J, E, Q.

Letter sounds are taught cumulatively. Two-letter sounds are taught separately, and then the letters are presented together for discrimination. Each successive letter is introduced and discriminated in the same cumulative manner. Discriminations may involve six to eight letters being presented at one time.

As letter sounds are introduced, students are taught to hold a sound as long as the teacher points to it. Holding a sound in this manner is important, because when students begin to decode words, they must sound out one letter as they scan ahead to the next. Students unable to hold a sound for several seconds are likely to pause as they scan ahead. Pausing between sounds often prevents students from translating blended sounds into a word.

Regular words

A regular word is a word each letter of which represents its most common sound. Teaching students to decode regular words involves two stages. At the first stage, students sound out words by saying the sound represented by each letter, *mmmaaannn*, then translate the blended sounds into a word spoken at a normal rate.

At the second stage of the introduction of regular words, students decode words by sight and do not sound out the word, but read it directly at a normal rate. Words that contain only letters previously presented in isolated sound tasks are introduced.

The difficulty about a word results from its (a) familiarity, (b) length, (c) location of stop sounds within it, and (d) location of consonant blends. Words are introduced in the following order, where *v* = vowel and c = consonant:

1. vc and cvc words in which each letter has a continuous sound: *fan*.
2. vc and cvc words beginning with a continuous sound but ending with a stop sound: *sit*.
3. cvc words beginning with stop sounds: *cup, tin* and *bid*. With words beginning with a stop sound, students may pause between the stop sound and the sound following it, or distort the sound following the stop sound, in both cases producing word identification errors.
4. vcc and cvcc words with final consonant blends. A blend is a cluster of two or three consonants each representing its most common sound. Examples of consonant blends are: (a) with continuous sound first: l*eft*, (b) with stop sound

first: f*act*, be*ds*, and (c) with three letters: bel*ts*

5. Words that begin with a consonant blend: *cr*ib, *bl*ed, *sn*ap, *fl*at.
6. Longer words such as ccvcc: *cl*amp; cccvc: *scr*ap; and *cccvcc: scr*imp.

Words of a new type are introduced once the student can decode about two words of an earlier type.

Sight-reading regular words. Sounding-out is taught so that students will develop a strategy of examining each letter of a word in a left–right progression and, thus, decode regular words accurately. However, fluency is also necessary and instant word recognition is required. Regular sight-words are introduced as soon as students are proficient in sounding out vc and cvc words that begin with a continuous sound.

Sight-word reading is taught in the manner shown in Figure 6.3. An asterisk indicates where a change has been made from the preceding phase.

Usually, teacher modelling would be included in this sequence. During the first few lessons, sight-words that had been used in the sounding-out exercise of the same day are introduced. After a few lessons, previously unseen words or words of a different type may be introduced. Students begin reading a new type of word as soon as they demonstrate mastery, that is, when they can read words without sounding them out with 90% accuracy at a rate of one word in every two seconds.

When learning sight-words, students must be taught to attend to all letters in the word rather than a few. To ensure that careful attention is paid to all letters, students are presented with minimally different word pairs. For example, cvcc words, where

(a) the first or last consonant in the blend is omitted: *bus—bust*
(b) the final consonant is varied: *bend—bent*

	Teacher	Students
1. (a)	Teacher points to word. "YOU'RE GOING TO SOUND OUT THIS WORD AND SAY IT FAST."	
(b)	Teacher touches each letter in succession.	students make sounds aloud: _mmaann_
(c)	"WHAT WORD?"	_man_ (pronounced at normal speed)
2. (a)	Teacher points to word. "NOW YOU'RE GOING TO TELL ME THIS WORD *WITHOUT SOUNDING IT OUT LOUD."	
(b)	Teacher touches each letter in succession. (pause)*	*students, sound out word subvocally: _ssuumm_
(c)	"WHAT WORD?"	_sum_
3. (a)	Teacher points to word. "TELL ME THIS WORD WITHOUT SOUNDING IT OUT LOUD." *Teacher does not touch each letter in succession. (pause)*—up to 5 seconds.	*_ssaat_ (subvocal)
(b)	"WHAT WORD?"	_sat_
4. (a)	Teacher points to word. "TELL ME THIS WORD WITHOUT SOUNDING IT OUT LOUD." *(reduce duration of pause to 2 seconds)	_nap_

Figure 6.3. Teaching format

and ccvc words where the second consonant in the blend is omitted: *bled-bed.*

Since beginning readers focus so heavily on the beginning letters of words, and since 75% of the words commonly appearing in primary readers can be discriminated on the basis of the first two letters, the authors suggest that a great deal of time should be spent on discrimination training in which the first letter is held constant while the remaining letters change.

Irregular words

An irregular word is a word which contains letter—sound correspondence which the student does not know; the student cannot, therefore, sound out and blend the sounds into a word. Some words may be considered irregular during the early stages of instruction, but will not be considered irregular later when students have been taught letter sounds.

For example, to a beginning reader, the a-r in *park* and the e-a in *eat* may be considered irregular as the letters do not represent their most common sounds. Later, when students have been taught the sounds of the letter clusters *ar* and *ea*, words like *park* and *eat* will no longer be irregular.

Irregular words are introduced after students have achieved 90% accuracy with a pause of only three seconds when sight-reading regular cvc words. Because of the complexity of decoding irregular words, students need time to master each individual word. The first several irregular words should be separated from one another by about four lessons; the next ten words are introduced at a rate of one word in every two or three lessons.

The sequence of introduction of irregular words is influenced by the following considerations:

1. The frequency of occurrence of the word in children's literature.
2. The similarity of the word to other words, e.g., from—form, of—off, were—where.

Introduction of similar words should be planned in such a manner that one of the words is introduced long before the other; a separation of at least 15 lessons allows students to master the first word before encountering the second.

Teaching irregular words. An irregular word is first sounded out as it is written, then it is translated into the correct pronunciation. For example, *was* is sounded out as 'waass' but is pronounced as *wuz*.

The purpose of this procedure is to increase the probability that students will continue to carefully attend to the letters that make up a word. The procedure also shows that the same basic strategy can be used with all words even though some are pronounced differently from what the blended sounds indicate. Without this demonstration, some students, after encountering irregular words, may stop using the sounding-out strategy as it no longer appears to be useful. The procedure also prepares students for later spelling exercises by demonstrating that students cannot rely simply on letter–sound correspondence to spell a word. After students have learned the first ten to fifteen irregular words in this manner, a format is used in which students do not sound out words.

Students are not taught a particular strategy for decoding irregular words. The teacher simply points to a word, says that it is a funny word, and tells students how to pronounce it. It is important to encourage students to continue to look at all the letters. One method of bringing attention to each letter is to have students spell the word after pronouncing it; this approach assumes that the student has been taught letter names. Discrimination exercises are also used in which minimally different words like *said* or *sad* are presented. Words of this nature require careful attention to each letter.

Passage reading

Sound-out. Sounding-out passage reading is introduced as soon as students can decode enough cue words having a continuous initial sound at a rate of three seconds per word when the words are printed in lists so that the teacher can present simple phrases. For the first ten to twenty lessons in which passage reading occurs, the teacher should require students to sound out each word. This procedure is used to ensure that students continue to examine each letter as the presentation format changes from lists to passages. After a short period, sounding-out is faded from use and students may directly read each word at a normal rate.

It is recommended that students read passages in unison, saying each word as they move their fingers from letter to letter. Group-responding in this manner ensures that students apply the sounding-out strategy, helps to maintain attention, and facilitates monitoring of student performance. As the students look at their own passages, the teacher claps hands to indicate when the students should move their fingers from letter to letter while sounding out each word without stopping between sounds.

Sight-reading of passages. Sight-reading of passages begins when students are able to sound out a story at the rate of one word in every five seconds on the first reading of a story.

To teach sight-reading of passages:

1. The teacher asks the students first to sound out the passage;
2. Then to sight-read the same passage;
3. After a week or two, sounding out is dropped;
4. The teacher claps to indicate when to sight-read the next word in the passage. Initially there is a pause of one second between words to give students enough time to prepare reading of the next word.
5. The passage may be reread several times to increase fluency: (a) one word in every three seconds during the first two weeks, (b) two seconds during the next eight weeks, and (c) 1.5 seconds thereafter.
6. Students then read the story *silently*.
7. Each student then reads the passages aloud as other students follow along; they raise their hands at the end of

each sentence in which there is an error.

8. Students who have not read sufficiently well are given additional practice (10-15 minutes) later in the day.

The length of passages is controlled so that passage reading can be completed in 15-20 minutes. Initially a passage may be two to four words in length. The length increases by one to two words per lesson, up to twenty-five words at the end of the first month, and 150 words at the end of four months.

Pictures come as a reward at the *end* rather than at the beginning of passages. Otherwise, students tend to rely too heavily on picture cues and guessing as methods of decoding. If commercial programmes are used, pictures may be covered.

Phonics analysis

1. Students are initially taught the most common sound for individual letters.

2. Later they are taught sound correspondence for letter combinations. A letter combination is a group of consecutive letters having a predictable sound: consonant digraph, *ch*ip; vowel digraph, f*eu*d; and vowel dipthong, cl*ou*d. The knowledge of the most common sounds of letter combinations expands a student's ability to decode words. A letter combination is taught if it has one consistent sound in 50% or more of the words in which it appears.

3. Minor sounds, sounds made by a particular letter or letter combination in 20 to 50% of the cases, are taught.

4. Students are taught a general strategy of first pronouncing a word by saying the most common sounds to determine whether the sounds represent a word; then if the word is not recognizable, by substituting the common sounds for minor sounds.

Comprehension

Comprehension questions are asked only after a student can decode a passage with relative ease. For average and above average students having no difficulty with decoding, comprehension questions can be incorporated into the first reading of the passage. Students experiencing decoding problems may be required to read a passage several times before comprehension questions are asked. Beginning questions may be initially inserted within a passage after a group of sentences.

Teaching procedure for literal comprehension. This is an introductory procedure used only with students who require structure. The procedure should be faded as soon as students show the ability to answer literal questions independently.

1. Have the students decode the passage until they can do so fluently.
2. Explain and test the student's understanding of the instructions describing how to respond to the comprehension questions.
3. Have the student read the first comprehension question; ask whether he/she remembers the answer; if not, have the passage reread until he/she comes to the sentence containing the answer.

If students refer back to the passage too often, present the passage and the questions on separate pages, or cover over the passage before answering the questions. Several factors, as stated below, influenced the difficulty of literal items:

1. The degree to which the questions are literal is influenced by the following characteristics. Questions become less literal when they are not identical to the sentence in the passage containing the answer. Changes may include alterations in words or word order. For example:
   Sentence: The cat lived in a mud house.
   Literal:
   The cat lived in a mud ———.

S.C.E.R.T., West Bengal
Library
Calcutta
25/3 ... Road

Altered order:
In a mud ——— lived a cat.
Word change:
The ——— lived in a mud home.

2. The length of the passage.
3. Complexity of the instructions indicating how students are to respond, e.g., circle, fill-in, or underline the word.
4. The use of pronouns increases the difficulty of comprehension questions as students must identify the pronoun antecedent before the question can be answered.

Teaching procedure for pronouns. The first step in teaching proper pronoun usage involves oral exercises to ensure that students know the meanings of the key pronouns: he, she, we, they, it, you, then her and him. The teacher or the student reads the passage and the teacher asks questions after each sentence.

Tom and Lisa got into trouble.
  "Who got into trouble?"
They had to stay in all weekend.
  "Did Tom have to stay in?"
He cried
  "Did Tom cry?"
  "Did Lisa cry?"

If the student makes an error, the teacher refers to the pronoun and explains the relationship between the pronoun and its referent. Figure 6.4 illustrates the format for teaching pronouns.

The remaining part of comprehension training involves teaching the student summarizing, making inferences, direction following, synonyms, antonyms and classification.

As mentioned in the introductory sentences to this chapter, this review of Carnine and Silbert's work has been cursory. Interested readers are urged to read *Direct Instruction Reading* and a parallel text by Silbert, Carnine and Stein, *Direct Instruction Mathematics*, 1981.

Teacher	Students
1. Teacher demonstrates.	
"HERE'S A NEW PRONOUN. THEY. THEY TELLS ABOUT MORE THAN ONE."	
2. Teacher provides practice on saying the definition.	
"WHAT DOES THE PRONOUN THEY TELL ABOUT?"	"More than one."
3. Teacher provides practice on applying the definition.	
"LISTEN: JOHN AND MARY. DO WE SAY THEY WHEN WE TALK ABOUT JOHN AND MARY?"	"Yes
"HOW DO YOU KNOW?"	"John and Marry are more than one."
4. "LISTEN: JOHN. DO WE SAY THEY WHEN WE TALK ABOUT JOHN?"	"No."
"HOW DO YOU KNOW?"	"John is only one."
"WHAT PRONOUN COULD TELL ABOUT JOHN?"	"He."
5. "LISTEN: FORK. DO WE SAY THEY WHEN WE TALK ABOUT FORK?"	"No."
"WHY NOT?"	"Fork is only one."
"WHAT PRONOUN COULD TELL ABOUT FORK?"	"It."
6. "LISTEN: FORK AND SPOON. DO WE SAY THEY WHEN WE TALK ABOUT A FORK AND SPOON?"	"Yes."
"HOW DO YOU KNOW?"	"Fork and spoon are more than one."
7. "LISTEN: BOYS. DO WE SAY THEY WHEN WE TALK ABOUT BOYS?"	"Yes."
"HOW DO YOU KNOW?"	"Boys are more than one."
8. "LISTEN: MARY. DO WE SAY THEY WHEN WE TALK ABOUT MARY?"	"No."
"WHY NOT?"	"Mary is only one."
"WHAT PRONOUN COULD TELL ABOUT MARY?"	"She."

Figure 6.4. Format for teaching pronouns

CHAPTER 7

Auditory Disorders

Experience shows that teachers often fail to identify children with hearing losses, and misidentify children with normal hearing as having a hearing deficit. Often, too, because the hearing handicap is not recognized, hearing handicapped children may be misdiagnosed as emotionally disturbed when they appear withdrawn or 'spaced-out', or as behavior-disordered when they 'act-out' the frustrations of being unable to communicate. Hearing-impaired students may fail to pay attention, may give wrong or bizarre answers to simple questions, may appear to be noncompliant, and may be retarded in academic development. In addition, for some children, the hearing loss may be intermittent, present on some days and absent on others. The resulting misdiagnosis may lead to mistreatment and the development of secondary problems. The primary hearing deficit may influence social, emotional, academic and communication spheres of performance. Thus, it is important that every child should be subjected to a hearing test for the identification any auditory deficit at the first opportunity.

Figure 7.1 illustrates the structure of the ear. In the case of normal audition, sound waves travel along the auditory canal to the tympanic membrane. Vibrations of the eardrum are converted into mechanical vibrations as they travel through the stapes, the hammer, the anvil and the stirrup. The function of the stapes is to amplify and modulate sound, and thus to protect the inner ear. Sound is conducted by the stapes to the

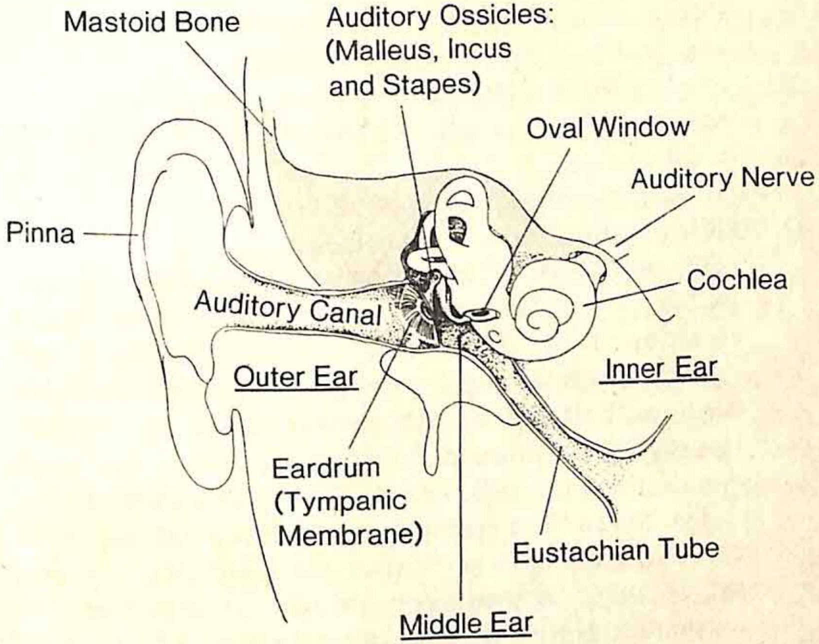


Figure 7.1. Anatomy of the ear

oval window in the cochlea within which sound is changed into electrical energy and transmitted to the brain by the auditory nerve. Difficulties in sound reception and transmission can occur at any point in the process.

Auditory disorders

Auditory disorders are of two major types: conductive and/or sensorineural. Conductive disorders involve the outer and/or the middle ear. Sensorineural losses involve the inner ear, the cochlea, the auditory nerve, and/or the brain. Auditory deficits may be bilateral or unilateral; 80% of hearing-impaired children have bilateral losses. In the case of approximately half of all children with a hearing loss the cause is unknown.

Conductive disorders

1. Blocakge of auditory canal may occur as a result of:

- atresia: congenital absence of the external canal;
- impacted wax in the auditory canal;
- obstruction from the insertion of a foreign body; or
- external lesion: a pimple or boil in the skin of the external canal.

2. Perforated eardrum.
3. Middle ear disorders:
   - *otitis media*: an inflammation or infection in the middle ear; may develop from a head cold in which nasal secretions back up and block the eustachian tube; air pressure in middle ear is no longer equalized. Otitis media may also be caused by infected adenoids, tonsils or sinuses. Mild to moderate hearing losses, the most common type, usually result from chronic otitis media.

     The condition is usually treated with an antibiotic or a decongestant; however, many ear infections are viral rather than bacterial and do not respond well to antibiotics. Nevertheless, because there is no easy way to distinguish viral and bacterial infections, antibiotics are frequently given. The decongestant is used to open the eustachian tubes, equalize pressure, and allow fluids to drain from the middle ear (Batshaw and Perret, 1981).

     If the infection persists a surgeon may have to perform a *myringotomy* in which the eardrum is cut; a polyethelene tube is inserted through the eardrum to equalize the pressure and permit fluids to drain. Over a period of months, the tube works its way into the auditory canal and drops out; the eardrum closes over the incision and the ear is like new (Batshaw and Perret, 1981). A *mastoidectomy* may also be performed in which cells in the mastoid are removed to promote adequate drainage of pus from the infected middle ear. Tonsils and/or adenoids may also be removed to provide adequate ventilation of the eustachian tube.
   - *ossification of the ossicles*: if otitis media persists, the fluid or pus in the middle ear congeals and sticks to the ossicles, eventually fusing them. *Otosclerosis*, usually a

hereditary disorder, causes a growth of bone tissue around the stapes. *Fenestration* is a form of treatment in which a new oval window is made in the semicircular canal; it is then closed with a membrane that picks up sound waves that bypass the eardrum and the immobile stapes (Smith and Neisworth, 1975). Treatment may also involve mobilization of the stapes by breaking away the bony tissue.

Sensorineural disorders

These disorders involve the cochlea, the auditory nerve and/or the brain. Approximately, one-half of these disorders are caused by autosomal recessive disorders in which a child's sibling or parents are affected. There are numerous causes of sensorineural disorders:

1. Drugs, poisons and allergens may affect the structure of the middle ear.
2. Bacterial and viral infections.
    (a) Maternal rubella: rarely a cause of total deafness, but may result in severe hearing impairment.
    (b) Encephalitis.
    (c) Diseases such as measles, mumps, influenza and meningitis which affect the respiratory system and result in high temperatures causing damage to nerve fibers.
3. Rh and other incompatibilities.
4. High intensity noise may damage hearing.
5. Blows to the head may cause hearing losses of varying degrees.
6. Birth injury: prematurity, prolonged labour or difficult delivery are all associated with the possibility of auditory impairment.
7. Metabolic and endocrine disorders, e.g., hypothyroidism (cretinism).
8. Presbycusia: hearing loss due to advancing age (Smith and Neisworth, 1975).

A *hearing aid* raises the intensity of sources by 30-50db. Aids are not as effective for high frequency losses as they are for losses that cross the entire spectrum of frequencies, because high frequency losses require different amplification at various frequencies, a task most hearing aids cannot accomplish effectively (Batshaw and Perret, 1981). Thus, hearing aids are generally more useful for conductive and sensorineural losses characterized by deficits in the high frequency range.

Assessment

Most children with a profound loss are identified from 9 to 12 months of age when they stop babbling and fail to follow spoken commands; initially, deaf children coo and babble at the same age as hearing children. Approximately twenty per cent of moderately to severely hearing-impaired children are not identified until after eighteen months of age. Many children with mild to moderate loss are first identified at age six as part of a school screening programme (Batshaw and Perret, 1981). Early identification is imperative as the effects of secondary or multiple disorders are not merely additive but multiplicative.

One method of assessing infants is to observe their response to a variety of auditory stimuli presented in the natural environment. Observations are made of a startle response, arm and leg movement, crying, blinking or orienting following presentation of sudden and intense auditory stimulation in the absence of a change in visual stimulation. This method, although effective in some respects, may fail to identify mild to moderate hearing losses because the auditory stimulus used to elicit the response must be of a relatively high intensity. Also, auditory losses may be within a range of frequencies not tested by the auditory stimulus. Furthermore, the absence of a response does not necessarily indicate the presence of a hearing loss as infants familiar with a generally noisy environment may become habituated to loud noises.

Infants and other individuals who are unable to report sound reception—severely retarded or disturbed persons—may be evaluated by *physiological audiometry*, involving measurement of galvanic skin response (GSR), and electroencephalic (EEG) activity. *Galvanic skin response audiometry* involves an assessment of the change in electrical conductivity of the skin following presentation of a sound. This approach involves classical conditioning. At the first stage, a tone (a neutral stimulus) repeatedly precedes presentation of a mild electric shock (an unconditioned stimulus) which produces a change in GSR (an unconditioned response). After frequent pairing of the tone and the shock, the tone becomes a conditioned stimulus which produces a change in GSR in the absence of the shock.

Electroencephalic (EEG) audiometry is also referred to as auditory evoked potential testing. Electrodes are pasted to the subject's head and a clicking sound is presented through earphones. The subsequent neurological activity resulting from the auditory stimulation is recorded on a polygraph. Wong and Shah (1979) developed an interesting method of *audiometry using conditioning*. Children being tested face a board on which two masks have been mounted; there is a light in the nose of each mask. The light in the nose of the Mickey Mouse mask to the left of the subject lights up when sound is presented to the left ear. The light in the nose of Donald Duck's mask to the right of the subject lights up when sound is presented to the child's right ear. After a few trials, the child learns to look at the face in the direction from which the sound comes. At this point, the light is not paired with the sound, but only appears after the subject has looked in the direction of the sound source. In this condition, the light acts as a reinforcer for looking in the correct direction.

Pure-tone audiometry. Humans are able to hear sound that ranges in frequency from 20 to 20,000 cycles per second (cps), where cps are expressed as Hertz (Hz). For example, human speech is within the range of 250 to 4000 Hz. The most important sounds in the environment are between 125 and

8000 Hz. Thus, an audiological assessment usually evaluates an individual's ability to hear the following seven frequencies: 125, 250, 500, 1000, 2000, 4000, and 8000 Hz. Figure 7.2 displays an audiogram on which the results of an audiological evaluation are recorded. Sound intensity is expressed in terms of decibels (dB). An audiometer generates pure-tone sounds at each of the seven frequencies listed above. Audiometers are calibrated so that zero dB is the threshold intensity at which the average person is just able to hear each of the frequencies tested. (Refer to the ordinate of Figure 7.2.) Failure to hear a particular sound frequency until its intensity equals or exceeds 20 dB is indicative of a significant hearing loss. (See Table 7.1 for a description of the various levels of hearing loss.)

The severity of a hearing loss is defined in terms of the average air conduction loss at 500, 1000 and 2000 Hz, the 'speech frequencies'. The average loss for these three frequencies predicts the threshold for understanding speech.

There are two major types of *conductive* audiometric assessments, air conduction and bone conduction. During an air conduction test, the examinee is fitted with earphones and sound is transmitted down the auditory canal and across the ossicles to the cochlea. A specially designed soundproof room is generally used during a threshold evaluation, but not during a screening test. The audiometer is set at 20 dB during a screening test and the sound of the following frequencies is presented to the subject, one ear at a time: 500, 1000, 2000, and 6000 Hz; 4000 Hz is presented at 30 dB. If a subject fails to hear one or more of these sounds, a second screening is conducted. If, again, one sound is not heard, a threshold test is conducted. During a threshold test, the lowest intensity is determined at which the subject is just able to hear (each of the seven sound frequencies from 125 to 8000 Hz. An air conduction test reveals if a hearing deficit exists, but does not indicate whether the difficulty is conductive, in the outer or middle ear, or sensorineural, in the inner ear. If an air conduction test reveals a hearing deficit, a bone conduction test is administered. In the bone conduction test, a device is fitted to the side of the

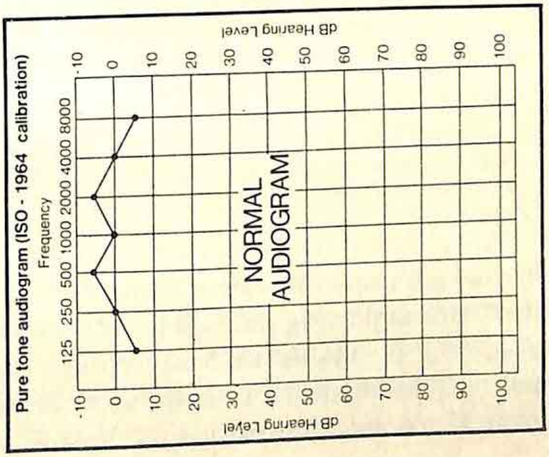


Figure 7.2(a)

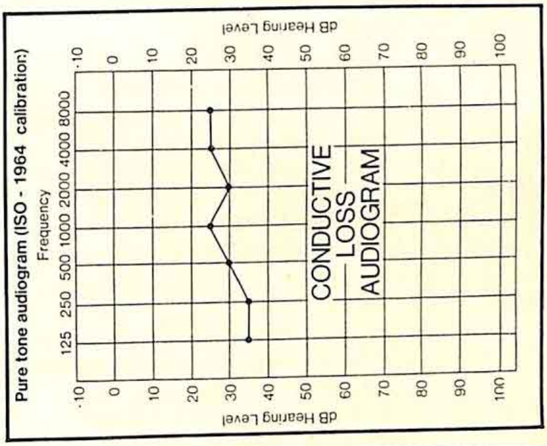


Figure 7.2(b)

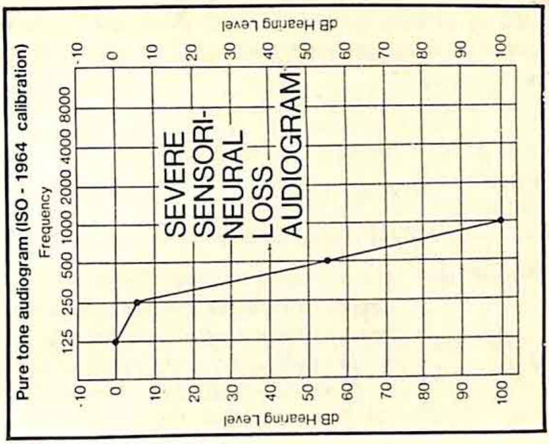


Figure 7.2(c)

TABLE 7.1: *Scale of hearing impairment descriptive terms of hearing loss, and relations between the hearing threshold level and probable handicap and needs*

Hearing level in dB	Descriptive term of hearing loss	Probable handicap and needs
10 to 26 dB	Normal limit	No significant handicap for most children. Some at upper limits may have difficulty in sustained attention and may benefit from a hearing aid.
27 to 40 dB	Mild	Slight handicap for some, but significant handicap for many children. Difficulty in hearing faint speech and speech at a distance; needs preferential seating: may benefit from lip-reading instruction: benefits from the use of a hearing aid.
41 to 55 dB	Moderate	Significant handicap. Understands conversational speech at a distance of 3 to 5 feet; needs a hearing aid, auditory training, lip reading, speech correction, and preferential seating.
56 to 70 dB	Moderate to severe	Marked handicap. Conversation must be loud to be understood; difficulty in groups and classroom discussions even with a hearing aid; same needs as child with significant handicap; may be in a special class for the hearing-impaired and integrated into a regular class.
71 to 90 dB	Severe	Severe handicap. May hear a loud voice 1 foot from the ear; may identify environment noises; same needs as child with significant handicap; may enter a regular class at a later time.
More than 90 dB	Profound	Extreme handicap. May hear some loud sounds; probably does not rely on hearing as a primary communication channel; needs a special class or school for the deaf; some of these children may be integrated into regular high schools.

SOURCE: Reprinted, with slight adaptations, from Gellis, S., and Kagan, Benjamin: *Current Pediatric Therapy*, 6, c 1976, by the W.B. Saunders Co., Philadelphia.

subject's head which transmits sound along the mastoid bone to the cochlea without passing through the outer or the middle ear. If the subject is unable to hear sound either by air conduction or by bone conduction, the difficulty lies in the inner ear or in a central process. Alternatively, if the subject is able to hear sound conducted through the mastoid bone, but not conducted by air, the difficulty resides in the outer or the middle ear. Figures 7.2(a), (b) and (c) illustrate audiograms for normal audition, as well as for conductive and sensorineural losses.

Acoustic impedence audiometry. If a conductive loss is indicated, as acoustic impedence test may be performed to further identify the source of the deficit. A plug is placed in the ear canal to create an airtight chamber. Air is then either pumped into or removed from the canal so that the pressure ranges from − 300 to + 200 millimetres of water. A sound is presented, and by measuring how the sound bounces off the eardrum at different pressures, one can get an idea of the eardrum's elasticity. Responsiveness of the eardrum is recorded on a *tympanogram*. If the eardrum is normally flexible, a normal distribution of responsiveness is recorded; however, if the eardrum is immobile because of ossification of the ossicles or acute infection in the inner ear, a flat line may be recorded on the tympanogram. Normally, the tympanogram returns to normal within a week. If the problem persists, a surgeon may perform a myringotomy (Smith and Neisworth, 1975).

Speech audiometry. A pure-tone audiometric assessment evaluates an individual's ability to hear pure-tones. A pure-tone is a sound emitted at a single frequency, for example, 500 Hz. Most sounds in the environment, including speech sounds, are however complex and comprises several frequencies emitted at the same time. As a result, pure-tone audiometry may not adequately assess one's ability to discriminate complex speech sounds. A speech reception threshold test may be employed to evaluate one's ability to hear and understand speech. In a speech audiometry test, a subject listens through earphones to prerecorded words presented to each ear individually. The subject hears spondee words having two syllables, each with equal stress, for example airplane, cowboy, and firetruck. The subject repeats to the examiner the word that he has heard. As the test proceeds, the intensity of successive words is systematically decreased. The speech reception threshold is defined as the lowest intensity level at which the examinee can hear 1/2 of the list of spondee words. Although this test evaluates one's ability to hear speech sounds, the task is unnatural, and the results may be confounded with the subject's speech skills.

Wepman Auditory Discrimination Test (Wepman, 1978). This test consists of forty pairs of monosyllabic words of equal length differing by only one sound, such as *thick-sick* and *wreath-reef*. Comparisons are made between 13 initial consonants, 13 final consonants, and 4 medial vowels. The word pairs are read by the examiner and the student indicates whether the words pronounced are the same or different. The test is inexpensive, brief, reliable and can be administered by a teacher or nurse. Difficulties with this test are: (a) the intensity and enunciation of the words are not standardized, (b) distance of the examiner from the subject and ambient noise are not controlled, (c) the task is unusual and does not require comprehension of speech sounds under typical conditions, and (d) young children may have difficulty in understanding the concepts of same and different. Most important, however, as previously reported in the chapter on norm-referenced and criterion-referenced tests, there is no evidence of criterion or content validity, and the test does not provide the information needed to assess validly a child's auditory discrimination abilities (Salvia and Ysseldyke, 1981).

Goldman–Fristoe–Woodcock Test of Auditory Discrimination (Goldman, Fristoe and Woodcock, 1970). This test when it first appeared in the market appeared to correct many of the limitations of the previous tests. The test is designed for four-year old children to adults. The examinee is presented with test plates on each of which there are four separate line drawings. A prerecorded word is read to the subject who is required to point to the picture representing the word. The words represented by pictures on each test plate differ only in terms of one phoneme, for example *lake* and *wake*. Training plates are used before the test to ensure that the subject correctly labels each picture used in the test. The subject's response is simple and unconfounded by speech problems. There are two subtests: (a) a quiet test in which there is no background noise, and (b) a unique noise subtest in which the words are presented against the type of noisy background one might find in a cafeteria. The test appears to have diagnostic potential as the examiner can obtain separate scores for voiced, unvoiced, plosives, continuants, and nasals. In all, an attractive looking test with *high face validity*. Psychometrically, however, the test is of little value. For some age levels, the reliability of the total scores for the quiet and noise subtests is unacceptably low. Even the authors note that the diagnostic error analysis of voiced, unvoiced ... sounds is unacceptable. Construct validity is questionable, as it appears that the test results may be influenced by intelligence and cognitive flexibility (Shelton, 1972). The use of the tape recorder and earphones is not adequately standardized. Evidence of content validity is inadequate. The task of sound discrimination and picture–word matching is atypical. The G–F–W Test is most disappointing. One must question the ethics of making a test of such poor psychometric qualities generally available to users qualified to administer the test, but unable to judge its theoretical and statistical characteristics.

A number of *group auditory screening tests* such as the Fading Numbers Test (Dahl, 1949), the Massachusetts Hearing Test (Johnson, 1948) and the pulse-tone group test (Reger and Newby, 1947) have lost popularity because of low validity and reliability (Salvia and Ysseldyke, 1981). A number of observations may be repeatedly made of children's responses in a variety of typical conditions. The behaviours observed may indicate the need for a referral. An audiologist is responsible for hearing evaluation and rehabilitation. An otologist or otolaryngologist is a medical practitioner trained to conduct a physical examination of the ear and associated structures and processes, and to provide surgical treatment.

Behavioural observations

1. Frequent failure to respond to auditory stimuli to which other people in the surrounding environment respond.
2. Appears to respond willingly when attention is gently focused physically.
3. Occasionally responds to auditory stimuli by looking in the wrong direction.
4. Sometimes attends to only part of a verbal message.
5. Cocks head to one side; cups one ear with hand; leans forward toward speaker or focuses intently on speaker's lips.
6. Frequently asks for repetition or clarification of a verbal message.
7. Confuses words with the following sounds: s, sh, ch, t, k, th, v, p, f.
8. Exhibits a speech disorder in which these sounds are involved.
9. Occasionally attends to irrelevant auditory stimuli.
10. Auditory attention is short-term.
11. Speaks with an unusually soft or loud voice.
12. Adjusts record players, radios and other similar devices to a high intensity.

CHAPTER 8

Visual Disorders

The discussion that follows provides an introduction to some of the major visual disorders, their causes, methods of testing and treatment. For a more comprehensive review of the topic, the reader is referred to a text by Kirk (1981), *Vision Pathology in Education*. In addition, a variety of excellent resource materials are available from the National Society for the Prevention of Blindness in New York.

Figure 8.1 illustrates the anatomy of the eye. Visual disorders associated with the conjunctiva are discussed first, followed by a review of the defects of the lens, vitreous humor, retina, and extraocular muscles.

Conjunctiva

The conjunctiva is a thin, transparent mucous membrane lining the eyelids, and covering the anterior part of the eyeball, except for the cornea. Mucous secretions from the conjunctiva lubricate movement of the lids over the eyeball. *Conjuctivitis*, the most universal of all eye diseases (Chalkley, 1974), is inflammation of the conjunctiva caused by bacteria, viruses, dust, pollen, fungi, parasites, allergies, and chemical irritants. A mild form of conjuctivitis causes redness and tearing. *Bacteria conjuctivitis*, the most common form (Kirk, 1981), may be either acute or chronic, and makes the eyes red, congested and irritated. The disorder usually lasts two weeks but, if properly treated, may last two days. Acute catarrhal

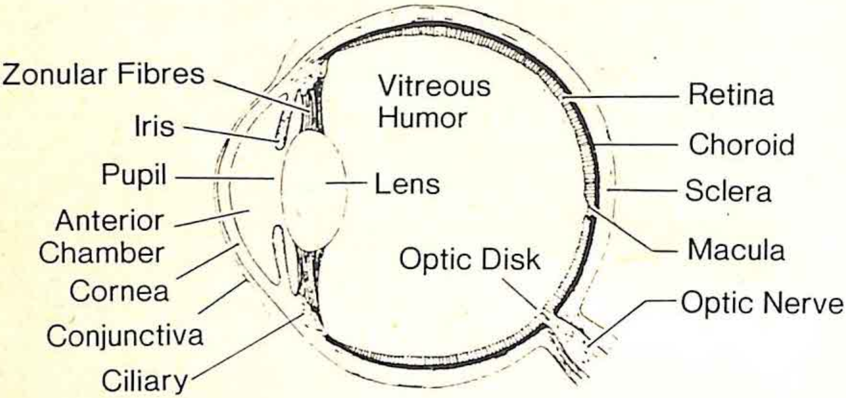


Figure 8.1. Anatomy of the eye

conjunctivitis or pink eye causes the eye to become exceedingly inflamed and produces a moderate discharge (Kirk, 1981).

Trachoma, rare in North America, is considered by the World Health Organization to be the greatest single cause of progressive loss of sight in countries that do not have high standards of hygiene. The disorder is reportedly common in the Mediterranean basin, the Middle East and the Orient. Trachoma is a chronic viral disease causing the formation of scar tissue on both the conjuctiva and the cornea. The disorder is readily spread in a family as a result of close contact. Early symptoms include tearing, photophobia (abnormal sensitivity to light), pain, discharge, swelling, and redness of the anterior eyeball. Characteristically, a chronic disease of long duration, trachoma, when treated early with sulfonamides, tetracycline and streptomycin, has an excellent prognosis. However, because of lack of treatment, some 20 million peope in the world are blind as a result of trachoma (Kirk, 1981).

Cornea and iris

The iris, visible through the cornea, is coloured, round in shape, with an opening or pupil in the middle. The size of the pupil is expanded or contracted to control the amount of light reaching the interior of the eye. The cornea, covering the anterior eye, is transparent and approximately of the same diameter as of the iris. The function of the cornea is both protective and refractive. In fact, the refractive power of the cornea is 2.5 times that of the lens (Kirk, 1981). Three types of refractive errors are associated with the cornea: astigmatism, hyperopia and myopia. The latter two disorders may also involve the shape of the eye, and the lens.

With *astigmatism*, the ability of the eye to focus is reduced because of an irregularity in the shape of the surface of the cornea. As a result, because different parts of the cornea have different focal lengths, blurring is produced. Constant effort by the lens to accommodate—change its shape to bring the image into focus—may cause eye-strain, headaches and pain. The disorder is nearly always congenital (Kirk, 1981). Astigmatism may be corrected by a cylindrical lens in the shape of a segment of a cylinder. The lens has no refractive power along one axis, and high refractive power at right angles to the axis. Its principal focus is a line, not a point.

One purpose of the cornea is to focus rays of light on the retina. In the case of *myopia*, or nearsightedness, light rays focus in front of the retina. Myopia, the inability to see distant objects clearly, is usually caused by an increase in the axial length of the eyeball, but may also result from an excess amount of refractive power in the cornea or the lens. Symptoms of myopia may include squinting to see distant objects, holding reading material close to the eyes, fatigue, headaches and inflammation of the perimeter of the eyelids. Eye-strain is less common with myopia than with hyperopia, or farsightedness (Kirk, 1981). Myopia may be corrected with a concave or minus lens that decreases over-convergence and focuses light rays on the retina.

Hyperopia, a condition in which light rays converge behind the retina, occurs when the axial length of the eyeball is too short, or when the cornea and/or the lens do not have sufficient refractive power. Unless extreme or astigmatic, hyperopia does not usually affect children's vision as they are able to accommodate by changing the shape of the lens and increasing its refractive power (Kirk, 1981). In mild cases, corrective lenses are usually not prescribed. (In the case of severe hyperopia, near vision may be blurred even with accommodation of the lens.) Children with hyperopia are likely to have eye-strain, a burning sensation, tearing, headaches, and more blinking than is normal. Most hyperopes have some astigmatism. In young children, hyperopia is a predisposing cause of strabismus, or disorientation of one eye (Kirk, 1981).

Hyperopia is corrected with a convex spherical or plus lens that increases refraction and brings light rays to focus on the retina. The disorder decreases gradually until age twenty-five. The prognosis is good if children, given lenses, wear them (Kirk, 1981). Corrective lenses may relieve eye-strain and prevent strabismus.

Lens

The lens is situated behind the iris and is held in place by the zonular fibres attached to the ciliary muscles. Contraction of the ciliary muscles relaxes the zonular fibres, allows the lens to become more spherical, increases its refractive power, and permits focus upon near objects. The lens is rounded to focus on near objects and flattened to focus on distant objects. The function of the lens, as that of the cornea, is to focus light on the retina, and, as previously mentioned, both structures may be involved with refractive errors such as myopia and hyperopia.

Presbyopia, or blurring of near vision associated with middle age, results from decreasing elasticity of the lens. This condition may be corrected by a bifocal lens.

Cataract is clouding of the lens which may vary from a few spots to the entire lens. Kirk (1981) describes a variety of causes: hereditary; intrauterine infections such as rubella;

chromosome aberrations such as Down's syndrome; prematurity; drugs such as systemic steroids; ocular diseases such as glaucoma; inborn metabolic disorders such as diabetes, as well as systemic disorders like Marfan's syndrome. The disorder is also associated with jaundice in newborns and galactosemia in children. Galactosemia is a congenital disorder in which there is increased galactose in the blood resulting from an inability to metabolize the sugar in milk. Cataract may be corrected by surgical removal of the lens and the use of a contact and/or optical lenses.

Vitreous humor

The vitreous humor is a transparent gelatinous substance occupying the space between the lens and the retina. The function of the vitreous is to support the shape of the eye. The aqueous fluid produced by the ciliary body constantly circulates in the posterior chamber, opening through the pupil into the anterior chamber, and exits the eye at a point where the iris and the cornea merge. This inflow and outflow of fluid helps to maintain a normal range of intraocular pressure (Harley and Lawrence, 1977).

Glaucoma refers to a number of conditions in which drainage of the aqueous fluid is impeded. As a result, intraocular pressure increases, the cornea becomes cloudy and gray, photophobia develops, peripheral vision is lost, and the optic nerve fibre begins to degenerate. The result may be total blindness (Langley, 1980). There are three types of glaucoma. *Primary glaucoma* is based on variations in the anatomical structure which reduces drainage of the aqueous fluid from the eye. Primary glaucoma may be open or closed angle. Primary open angle is the most common type. The disorder has an insidious onset and may go unnoticed until permanent loss of vision occurs. Alternatively, primary closed angle glaucoma may have a sudden, painful onset resulting in nausea, vomiting and blurred vision (Kirk, 1981). *Secondary glaucoma* is produced by another eye disorder that either alters the density of the aqueous fluid or reduces the efficiency of the drainage mechanism (Harley and Lawrence, 1977). Secondary glaucoma may also be produced by topical steroid therapy or systemic corticosteroids (Kirk, 1981). *Congenital glaucoma* results from incomplete formation of the aqueous drainage system before birth. *Infantile glaucoma*, apparent within the first three years of life, is transmitted by a recessive gene (Kirk, 1981). The treatment of glaucoma usually involves drugs to decrease aqueous production and increase aqueous drainage.

Retina

The retina lining two-thirds of the inside, the posterior wall of the eye comprises two types of light sensors, rods and cones, described in terms of their shape. The cones are situated predominantly in the centre of the retina, and are most densely concentrated in the fovea centralis, a depression in the middle of the macula where vision is most acute. The cones are used in distant and colour vision, and in detailed activities such as reading. The cones are sensitive to red, green, or blue light, and a dysfunction in one or more of these types of colour sensors results in *colour blindness*. The rods, more numerous than cones, except in the macula, are located predominantly in the perimeter of the retina. The rods are used for night and peripheral vision, as well as movement detection. When a driver's rod vision detects an approaching car, the driver will turn his eyes so that the foveal cones may discern details of the vehicle (Kirk, 1981).

Xerophthalmia. In many underdeveloped countries such as in South and East Asia, as well as in Central and South America, vitamin A deficiency is one of the major causes of impaired vision and even total blindness (Joint Study Committee, 1972). Younger children, 6 months to 4 years of age, are much more susceptible to xerophthalmia than are older children. The disease, affecting the functioning of the rods, is responsible for thousands of children losing their sight every year. The disorder is often precipitated by such serious childhood infections as gastroenteritis and measles, by the semi-starvation regimens often used as treatment of these conditions, and by a generally poor state of protein and caloric nutrition. Early symptoms of the disorder are night blindness, inability to see in dim light, and Bitot's spots on the conjunctiva (Joint Study Committee, 1972).

Retinitis pigmentosa is a genetic disorder causing cell death of the retina. Symptoms initially include loss of peripheral field vision, night blindness, and blurred vision. The field of vision becomes more restricted as the retina continues to degenerate (Langley, 1980). The onset of the disease generally occurs in the early teens, and is almost always bilateral. Frequently, the disorder is most in evidence when a teenager goes from a bright area to a dimly lighted area. He may become totally disoriented. When an individual with the disorder reaches the age of forty or fifty years, he may have only 3 to 5 degrees of central vision. In some cases the vision is sufficient for reading for many years (Kirk, 1981). No form of treatment is available.

Retrolental fiboplasia results from high concentration of oxygen and/or a long duration of oxygen treatment given to premature infants. Immature blood vessels grow abnormally from the retina into the vitreous humor where usually there are no blood vessels. The mass of vessels outgrows its capacity to nourish itself, and scar tissue develops (Langley, 1980). Once the activity has begun, there is no way to predict at what stage it will stop, even though the infant is no longer receiving oxygen. One-quarter of the cases progress to total blindness. Myopia and blindness are often found among individuals who retain useful vision. No form of treatment is available (Kirk, 1981).

Retinal detachment occurs when congential defects produce holes or tears in the retina, when there has been a penetrating injury, hemorrhage, or inflammation of the retina, or after removal of the lens in cataract surgery. The neural layer of the retina detaches. Usually, detachment is progressive and produces the sensation of a shadow coming down in front of the eyes. The most common symptom is the sudden appearance of floating spots caused by the entry of blood cells into the vitreous. There may also be the sensation of flashes of light. The treatment involves sealing the holes through the use of cryotherapy (freezing), photocoagulation (cauterizing with light), or diathermy (cauterizing with electricity). The scar tissue that is produced by these procedures seals the holes in the retina (Kirk, 1981).

Extraocular muscles

The six extraocular muscles attached to the sclera of each eyeball turn the eyes in an up, down, or rotational manner. These muscles are used to coordinate the movement of both eyes to facilitate binocular vision in which both eyes focus on a single object. Binocularity also produces depth perception or *stereopsis*. The two eyes are placed laterally so that they receive slightly different images of an object. These small differences are perceived by the brain as differences in depth. To obtain single binocular vision and depth perception, the images must be sharp and formed on the corresponding parts of the two retinas. As one looks from one object to another, at different distances, the eyes must change accommodation to maintain a sharp image, and converge or diverge to hold similar parts of the two images in the two foveas (Jobe, 1977). Imbalances of the extraocular muscles will disrupt depth perception.

Convergence involves turning both eyes inward in a coordinated manner to obtain a single image of an object. The amount of convergence is measured in terms of *prism diopters*. One prism diopter is deviation from a straight line of vision of one centimetre in 100 centimetres. Assuming that the distance between the eyes is six centimetres, to obtain a single image of an object 100 centimetres from the eyes, each eye must converge three centimetres toward the object making a total of six prism diopters of convergence (Jobe, 1977). Convergence refers to *fixation* or *fusion* where the eyes are oriented so that the image of an object falls upon the fovea centralis of each eye.

Heterophoria or *squint* involves a tendency for the eyes to deviate from coordinated alignment. One eye may tend to deviate inward (esophoria), outward (exophoria), upward (hyperphoria) or downward (hypophoria). The directional deviation of the eyes is usually not apparent; the condition may become more pronounced with fatigue. There are two tests for phorias: the cover test, and the Maddox rod test.

In the *cover test*, the subject is asked to look with both eyes at a small object 10-12 inches from the eye. One eye is then covered and the subject is asked to keep the eye open and to continue to look toward the object with both eyes. When the cover is quickly removed, evidence of a phoria is apparent, if the covered eye moves to realign itself. For example, if the eye turns inward to realign, there must have been a tendency for it to turn outward (exophoria). This test is rather difficult to conduct as the movement of the cover may inadvertently cause the movement of one or both eyes. It is not possible to observe whether there was movement in both eyes; it may also be difficult to observe movement in a single eye.

The *Maddox rod test* provides a more valid measure of phoria. In this test, the examinee is requested to focus with both eyes upon a small point of light while wearing a pair of glasses. In front of one eye there is no lens, while in front of the other there is a corrugated red lens in which the corrugations may be either vertically or horizontally oriented. The eye looking through the corrugated lens sees a line rather than a spot of light. The line is perpendicular to the orientation of the corrugations. If no phoria is present, the line seen by one eye will intersect with the point of light seen by the other eye. If a phoria exists, the line may appear above or below, or to the left or the right of the point, depending upon the orientation of the corrugations and the direction of the phoria. Prisms of various strengths measured in terms of prism diopters, as previously described, may be placed in front of the eye to cause the line and the point of light to intersect. The strength of the prism required to achieve intersection provides a measure of the degree of the phoria.

Heterotropia

In the case of *heterotropia* or *strabismus* one eye fixes its macula on an object of gaze while the other eye is directed inward (esotropia or cross-eye), outward (exotropia or wall-eye), upward (hypertropia), or downward (hypotropia). The angle of separation of the two eyes may be fixed or variable. The condition may be genetic in origin, and may occur at any age. If strabismus has its onset after normal fusion reflexes have developed, *diplopia* or double vision will be present. If the time of the onset is infancy or early childhood, diplopia will be absent, and either *alternating fixation* and *suppression* will be present, or *amblyopia* (reduced vision or blindness) will occur in one eye (Harley and Lawrence, 1977). When alternating fixation and suppression occur, the individual will attend to the image in one eye and ignore the image in the other eye for a period of time before alternating the eye to which attention is directed. *Amblyopia*, or lazy eye, is dimness of vision without any apparent organic cause and occurs as a result of continued disuse of an eye when only one eye is used for seeing. The image seen by one eye is shut out to avoid the discomfort of double vision. The most common cause of amblyopia is strabismus, although the condition may arise when different images are presented to the eyes as a result of other causes (Joint Study Committee, 1972). In young children, treatment can correct the condition. Surgery may be performed on the extraocular muscles to correct muscle imbalance. *Orthoptics*, or visual training or eye exercises, may be prescribed by an *orthoptist*. These exercises may involve the use of glasses or patches to force the child to use the lazy eye, and to bring the eyes into coordinated use.

Nystagmus is continuous, involuntary oscillation of the eyeball, usually lateral, but sometimes in a rotary or vertical direction. *Jerky* nystagmus, or slow movement in one direction followed by a rapid return to the original position, is sometimes associated with the internal ear, neurological, or drug intoxication problems. The disorder is sometimes associated with the use of Dilantin. *Pendular* nystagmus, or movements of equal speed and duration in each direction, is caused by congenital impairment of vision in the eye or optic nerve, or may result from other disorders such as corneal opacity, high a stigmatism or congenital cataract. Many children adjust to nystagmus and perform much better than expected, although the acts of reading, writing and other near point activities may be quite laborious (Kirk, 1981).

Onchocerciasis

Onchocerciasis, or *river blindness*, is a chronic, nonfatal disease involving threadlike, parasitic worms (filariae) that live in the nodules in the skin and subcutaneous tissues. The female worm discharges microfilariae that migrate through the skin causing an intensely itching rash, altered pigmentation, edema and atrophy of the skin. Microfilariae frequently reach the eye causing visual disturbances and blindness. The diagnosis may be conducted by a skin biopsy, or an ophthalmoscopic examination of the eye where microfilariae may be seen in the cornea, and in the anterior chamber of the vitreous. Microfilariae may also be found in the urine. The disease is transmitted through the bite of an infected female blackfly of the genus *Simulium*. Microfilariae are picked up when the fly feeds on an infected person, and are liberated in the skin of another person during a subsequent bloodmeal. Man infects flies as long as living microfilariae occur in the skin, i.e., for 10 to 15 years, if untreated. Susceptibility is universal. Geographically, the disorder is found predominantly in parts of both South America and Africa. In some localities, almost the entire population is infected and afflicted with associated blindness. Preventive measures include the use of protective clothing and insect repellents to avoid bites of the *Simulium* flies, as well as the control of larvae in rapidly running streams and artificial waterways through the use of biodegradable insecticides (Beneson, 1975).

Professionals

Various professional groups are involved in the assessment and treatment of visual disorders. An *ophthalmologist* is a medical practitioner trained in the diagnosis and treatment of all defects and diseases of the eye by prescribing drugs, glasses and other types of treatment including surgery. An *optometrist* is a non-medical practitioner who measures refractive errors—that is, irregularity in the size or shape of the eyeball or the surface of the cornea—and eye muscle disturbances. In his treatment, an optometrist may prescribe glasses or exercises. An *optician* grinds lenses according to a prescription received from an ophthalmologist or optometrist. An *orthoptist* prescribes a series of exercises to develop or restore normal team work of the eyes (Joint Study Committee, 1972).

Visual examination

A complete visual examination may involve the assessment of (a) structural defects such as cataract and glaucoma, (b) reflexive reactions such as pupillary responses to changes in light, and protective blinking when an object suddenly approaches the eye, (c) eye movements such as convergence, gaze shifting and tracking, (d) near and far vision, (e) visual field defects, for example, tunnel vision or blank spots, and (f) colour, form, and depth perception.

The *pupillary response* involves contraction or dilation of the pupil on account of changes in the intensity of light or in the distance of an object viewed. The absence of response may indicate a structural defect, cortical blindness, neurological impairment, or the absence of efficient central vision (Langley, 1980).

The absence of *convergence*, turning the eyes inward as an object moves toward the eyes from a distance of 14 inches, may indicate a muscular imbalance. *Gaze shifting* may be evaluated by presenting two objects, first attracting attention to one object, then shifting attention to the other. The absence of a shift of gaze from one object to the other may indicate a muscle imbalance, an incoordination problem, or a defect in the visual field. Similarly, when an object, twelve inches from the eyes in the centre of the field of vision, is moved horizontally or vertically, failure to track or follow the movement, or jerky rather than smooth tracking, may indicate muscle imbalance, lack of coordination, or a defect in the visual field (Langley, 1980).

An *ophthalmological examination* involves the use of a number of specialized diagnostic devices. An *ophthalmoscope* comprises a concave mirror and a battery-powered light source within a tubular handle. Sighting is through a single or binocular eyepiece. The scope is equipped with a rotary disc of lenses to permit observations of the eye at various depths and magnifications. The examination of the eye may be enhanced by administering drugs to dilate the pupil (Harris and Levey, 1975). An examination of this nature may reveal changes in the retina associated with glaucoma, and a detached retina.

A *retinoscope* is used to assess the refractive power of the eye. The retinoscope is a hand-held instrument containing a small lamp pointed at the patient's eye from a distance of two feet. The doctor observes the light reflected from the retina while the patient looks at a distant object. Lenses are placed in front of the patient's eye to determine what lens power is required to compensate for errors of refraction (Jobe, 1977).

An *ophthalmometer* is used to measure the dimensions, the capacity and the refractive errors of the eye. A *tonometer* uses an airblast to determine the interocular pressure arising from glaucoma. A *slitlamp* is used to assess the opacity of the lens in cataract cases. An *electroretinogram* is used to record electrical impulses generated by light striking the retina.

Visual screening

One of the most common tests used in visual screening is the

Snellen chart. The test requires the use of a chart on which are printed several rows of letters of the alphabet, each row being smaller in size than the one above. A Snellen notation such as 20/50 is assigned to each row to indicate that if the smallest row of letters that an examinee can read has a notation of 20/50, the examinee can read at 20 feet what the average person can read at 50 feet. The average vision has a 20/20 notation. For young children or mentally retarded persons who may not know the names of the letters of the alphabet, the *Illiterate–E* test may be used. This test is parallel in structure to the Snellen chart except that it uses only the letter E in various orientations: pointing up, down, left or right. An examinee may respond to the chart simply by pointing in the same direction as the arms of the "E" point. Both these charts are usually mounted on a wall 20 feet from an examinee, although, in some cases, they may be mounted beside the examinee who views a reflection of the chart through an optically correct mirror mounted 10 feet away from both the examinee and the chart. An examinee wears his own glasses during the examination, and with the aid of an occluder, one eye at a time is tested. All that is determined by the test is monocular visual acuity of central vision at twenty feet, myopia. Obviously, the test does not assess most of the broad variety of previously described disorders. Nevertheless, the authorities agree that a careful, painstaking test of central distance visual acuity is the most important single test of visual ability. This test identifies more children who require eye care than any other single test (Joint Study Committee, 1972).

The Snellen chart may also be used in conjunction with plus lenses as a test of hyperopia. Convex, plus lenses, of 1.75 to 2.25 diopter strength are put in front of an examinee's eyes and his ability to read the 20/20 line with the lens is evaluated. If an examinee can read the line with the lens on, it is assumed that he probably has as much hyperopia as, or more hyperopia than that represented by the lens, and a referral is made. The National Society for the Prevention of Blindness recommends the use of the Snellen chart alone or in conjunction with the plus lenses (Joint Study Committee, 1971).

Sometimes it is suggested that a near point (14 to 16 inches from the eye) visual acuity test be included in school vision screening because so much school work is done at this distance. However, the National Society does not recommend this test as a routine procedure. Even children with marked hyperopia have such a reserve of accommodative ability that they may be able to focus on a near vision test card for the few minutes that the test requires (Joint Study Committee, 1972). It is widely accepted that correction for far point acuity will correct near point acuity in most cases, if the amplitude and the range of accommodation are adequate. The problems at near point are more likely to be caused by binocular distortions.

The *Massachusetts Vision Test* was developed for use in public schools with children 5 to 18 years of age. This screening test comprises four subtests. Visual acuity at far point is tested with the 20/20 and 20/30 lines of the Snellen chart. Plus lenses are used with the Snellen chart to assess hyperopia. Phorias are tested at both near and far point with the use of the Maddox rod test.

There are a variety of *stereoscopic visual screening tests* including the Telebinocular Visual Survey, the Sight Screener (American Optical), the School Vision Tester (Bausch and Lomb), and the Titmus School Vision Tester. Most of these tests are generally similar to the Keystone. In this test, a stereoscopic picture card is inserted into a holder. The holder can be moved forward or backward to simulate near (16 inches) and far (20 feet) vision. The card is illuminated in a standard manner by a light built into the instrument. The examinee views the card with both eyes by looking through two viewing ports. The stereoscopic cards have two pictures mounted on them, and each eye is presented with a slightly different picture, usually of the same scene. The differences between the two pictures simulate the scene as it would naturally be seen from a distance. An occluder may be used to test the functioning of each eye separately. Some tests employ plus lenses to evaluate hyperopia. Most tests provide an assessment of new and far visual acuity, vertical and horizontal phoria, as well as depth and colour perception. The Keystone test may also be used in conjunction with the Spache Binocular Reading Test as a measure of suppression. According to Jobe (1977), the best results in terms of accuracy of referral are obtained in all stereoscopic visual screening, when tests of visual acuity and phorias are used. In general, the stereoscopic tests tend to result in a relatively high rate of both over- and under-referrals.

Jobe (1979) reports that teachers, untrained in the use of specialized observation skills are not able to use a checklist of symptoms to accurately identify children in need of visual care. Nevertheless, the National Society for the Prevention of Blindness has produced a checklist of symptoms for use by teachers. A modified form of this list is reproduced below.

Behavioural observation guide

1. Holds reading material of book size type closer than 14″ —— or further away than 20″ ——.
2. Makes frequent changes in the distance at which reading material is held.
3. Uses finger while reading.
4. Frowns or squints when attending visually.
5. Turns head sideways when looking or reading.
6. Shuts or covers one eye.
7. Tends to look in wrong direction when presented with visual stimuli —— or attends to only a part of the stimulus —— or during reading frequently loses place on return sweep —— or regresses frequently.
8. Confuses the following letters in reading or spelling: "o and a; e and c; n and m; h and n; r and f and t".
9. Excessive blinking.
10. Rubs eyes excessively.
11. Unable to see distant objects clearly.
12. Has red-rimmed, encrusted, swollen, or watery eyes.
13. Complaints of itchiness, burning, dizziness, headaches, nausea, blurred or double vision.

14. Eyes appear to be misaligned.
15. Appears to have difficulty in smoothly tracking visual movement.

A number of excellent pamphlets on vision are available from the National Society for the Prevention of Blindness, 79 Madison Avenue, New York, NY, 10016—

Vision Screening of Children	(P257)
A Guide for Eye Inspection and Testing —Visual Acuity	(P200)
Signs of Eye Trouble in Children	(G102)
Most Wonderful Eye in the World	(G105)
Why Safety Glasses?	(G112)
Professor Ludwig Von Drake's I.Q.	(G114)
Charlie Brown, Detective	(G116)
First Aid for Eye Emergencies	(G117)
Classroom Lighting	(G301)
The Human Eye	(V7)
Preschool Vision Screening	(P253)

References

ADELSON, E. and FRAIBERG, S. 'Gross motor development in infants blind from birth'. *Child Development*, 1975, **6**, 114-245.

BATEMAN, B. 'Learning disabilities—Yesterday, today and tomorrow'. *Exceptional Children*, 1964, **31**, 167-77.

BATSHAW, M. L. and PERRET, Y. M. *Children with Handicaps: A Medical Primer*, Baltimore: Paul H. Brookes, 1981.

BAYLEY, N. 'On the growth of intelligence'. *American Psychologist*, 1955, **10**, 805-18.

BECKER, W. C. and ENGELMANN, S. *Teaching 3: Evaluation of Instruction.* Toronto: Science Research Associates, 1976.

BECKER, W. C. and ENGELMANN, S. *Technical Report, 1976—1.* Eugene, OR: University of Oregon, 1976.

BECKER, W. C., ENGELMANN, S., and CARNINE D. W. 'The direct instruction model' in R. Rhine (Ed.), *Encouraging Change in America's Schools: A Decade of Experimentation.* New York: Academic Press, 1976.

BENESON, A. S. (Ed.), *Control of Communicable Diseases in Man.* Washington: American Public Health Association, 1975.

BLUM, H.L., PETERS, H. B. and BETTMAN, J. *Vision Screening for Elementary Schools.* Berkeley: University of California Press, 1968.

BRIGANCE, A. *Brigance K and 1 Screen.* North Billerica, MA:

Curriculum Associates, 1982.

BRIGANCE, A. *Brigance Diagnostic Inventory of Basic Skills.* North Billerica, MA: Curriculum Associates, 1977.

BROWN, L., BRANSTON, M.B., BAUMGART, D., VINCENT, L., FALVEY, M. and SCHROEDER, J. 'Using the characteristics of current and subsequent least restrictive environments as factors in the development of curricular content for severely handicapped students'. *AAESPH Review*, 1979, **4**, 407-24.

BROWN, L., BRANSTON, M., HAMRE-NIETUPSKI, S., PUMPIAN, I., CERTO, N. and GRUENWALD, L., 'Strategy for developing chronological age appropriate and functional curricular content for severely handicapped adolescents and young adults'. *Journal of Special Education*, 1979, **13**, 81-90.

BUROS, O. K. *The Seventh Mental Measurements Yearbook.* Highland Park, NJ: Gryphon Press, 1972.

BURTON, J. A. 'Deciding what to teach the severely/profoundly retarded student: A teacher responsibility'. *Educational Training of the Mentally Retarded*, 1981, **16**, 74-79.

CARNINE, D. 'Direct instruction: A successful system for educationally high-risk children'. *Journal of Studies and Curriculum*, 1979, **11**, 29-45.

CARNINE, D. and SILBERT, J. *Direct Instruction Reading.* Columbus, OH: Merrill, 1979.

CHALKLEY, T. *Your Eyes.* Springfield, IL: Charles C. Thomas, 1974.

CLUNIES-ROSS, G. 'Accelerating the development of Down's syndrome infants and young children'. *The Journal of Special Education*, 1979, **13**, 169-77.

COCHRAN, I. L. and CLELAND, C. C. 'Manifest anxiety of retardates and normals matched as to academic achievement'. *American Journal of Mental Deficiency*, 1963, **67**, 539-42.

COMPTON, C. *A Guide to 65 Tests for Special Education.* Belmont, CA: Pitman Learning, 1980.

DAHL, L. A. *Public School Audiotmetry: Principles and Methods.* Danville, IL: Interstate Press, 1949.

DIXON, R. *Morphographic Spelling.* Chicago: Science Research Associates, 1976.

ENGELMANN, S. *Direct instruction*. Englewood Cliffs, NJ: Educational Technology Publications, 1980.

ENGELMANN, S., BECKER, W. and CARNINE, L. *Corrective Reading Program*. Chicago: Science Research Associates, 1976.

ENGELMANN, S. and BRUNER, E. *Distar Reading, Level I.* Chicago: Science Research Associates, 1974.

ENGELMANN, S. and BRUNER, E. *Distar Reading, Level II.*, Chicago: Science Research Associates, 1975.

ENGELMANN, S. and CARNINE, D. *Distar Arithmetic, I* (2nd ed.). Chicago: Science Research Associates, 1975.

ENGELMANN, S. and CARNINE, D. *Theory of Instruction: Principles and Applications.* New York: Irvington Publishers, Inc., 1982.

ENGELMANN, S. and OSBORNE, J. *Distar Langauge, I.* Chicago: Science Research Associates, 1976, 1977.

ENGELMANN, S. and OSBORNE, J. *Distar Language, II.* Chicago: Science Research Associates, 1977.

EVANS, I., VOELTZ, L., HANASHIRO, R. *Selecting priority goals and appropriate interventions in educational programming for severely handicapped children—the multiple behavioral problems.* TASH Conference, New York, 1981.

FAIR, D. T. and BIRCH, J. W. 'Effects of rest on test scores of physically handicapped and non-handicapped children'. *Exceptional Child*, 1971, **38**, 335-36.

FROSTIG, M. *Developmental Test of Visual Perception.* Palo Alto, CA: Consulting Psychologists Press, 1963.

GELLIS, S. and KAGAN, B. *Current Pediatric Therapy.* Philadelphia: W. B. Saunders, 1976.

GOLDMAN, R., FRISTOE, M. and WOODCOCK, R. *Goldman–Fristoe–Woodcock Test of Auditory Discrimination.* Circle Pines, MN: American Guidance Service, 1970.

GUESS, D., HORNER, R. D., UTLEY, B., HOLVOET, J., MAXON, D., TUCKER, D. and WARREN, S. 'A functional curriculum sequencing model for teaching the severely handicapped'. *AAESPH Review*, 1978, 3, 202-15.

GUESS, D. and NOONAN, N. 'Curricula and instructional procedures for severely handicapped students'. *Focus on Exceptional Children*, 1982, **14**, 1-12.

GUESS, D., SAILOR, W. and BAER, D. M. *Functional Speech andLanguage Training for the Severely Handicapped*, Parts I and II. Lawrence, Kansas: H and H Enterprises, 1976.

HALLAHAN, D. P. and KAUFFMAN, J. M. *Introduction to Learning Disabilities*. Toronto: Prentice–Hall, 1976.

HAMMILL, D. 'Evaluating children for instructive purposes'. *Academic Therapy*, 1971, **6**, 341-53.

HAMMILL, D. D. and LARSEN, S. C. 'The effects of psycholinguistic training'. *Exceptional Children*, 1974 (September), 5-14.

HAMMILL, D. D. and WIEDERHOLDT, J. C. 'Review of the Frosting visual-perception test and the related training program' in L. Mann and D. Sabatino (Eds.), *First Review of Special Education*, Vol. **1**. New York: Grune and Stratton, 1972.

HARING, N. G. and BATEMAN, B. *Teaching the Learning Disabled Child.* Englewood Cliffs, NJ, 1977.

HARLEY, R. K. and LAWRENCE, G. A. *Visual Impairment in the Schools.* Springfield, IL: Charles C. Thomas, 1977.

HARRIS, W. M., and LEVEY, J. S. (Eds.). *The New Columbia Encyclopedia.* New York: Columbia University Press, 1975.

HARTER, S. 'Mental age, IQ, and motivational factors in the discrimination learning set performance of normal and retarded children'. *Journal of Experimental Child Psychology*, 1967, **5**, 123-41.

HAYDEN, A. H. and DMITRIEV, V. 'The multidisciplinary preschool program for Down's syndrome children at the University of Washington Model Preschool Centre' in B. Z. Friedlander, G. M. Sterritt, and G. E. Kirk (Eds.), *Exceptional Infant* (Vol. 3), *Assessment and Intervention.* New York: Brunner/Mazel, 1975.

HAYDEN, A. H. and HARING, N. G. 'The acceleration and maintenance of developmental gains in Down's syndrome school-age children' in P. Mittler (Ed.), *Research to Practice* *in Mental Retardation* (Vol. I)—*Care and Intervention.* Baltimore: University Park Press, 1977.

HOLVOET, J., GUESS, D., MULLIGAN, M. and BROWN, F. 'The individualized curriculum sequencing model (II): A teaching strategy for severely handicapped students'. *Journal Association of Severely Handicapped*, 1980, **5**, 337-51.

JOBE, F. W. *Screening Vision in Schools.* International Reading Association, 800 Barksdale Road, Newark, Delaware, 1971, 1977.

JOHNSON, P. W. 'The Massachusetts Hearing Test'. *Journal of the Acoustical Society*, 1948, **20**, 697-703.

Joint Study Committee of the American School Health Association and the National Society for the Prevention of Blindness. *Teaching About Vision.* National Society of the Prevention of Blindness, Inc., 79 Madison Avenue, New York, NY, 10016, 1972.

KALVERBOER, A. E. *A Neurobehavioral Study in Preschool Children.* London: Heinemann, 1976.

Keystone Visual Survey Tests. Keystone View Company, 2212 E. Twelfth St., Davenport, IA, 52803.

KIRK, E.C. *Vision Pathology in Education.* Springfield, IL: Charles C. Thomas, 1981.

KIRK, S. A., MCCARTHY, J. J. and KIRK, W. D. *Illinois Test of Psycholinguistic Abilities.* Urbana, IL: University of Illinois Press, 1968.

LANGLEY, M. B. *Functional Vision Inventory for the Multiple and Severely Handicapped.* Stoelting Co., 1350 S. Kostner Avenue, Chicago, IL, 60623, 1980.

MADDEN, R., GARDNER, E. and COLLINS, C. *Stanford Early School Achievement Test*, Level 2. New York: Harcourt Brace Jovanovich Publishers, 1981.

MALPASS, L. F., MARK, S., and PALERMO, D. S. 'Responses of Retarded Children to the Children's Manifest Anxiety Scale', *Journal of Educational Psychology*, 1960, **51**, 303-8.

Massachusetts Vision Test. Enquire at Welch–Allyn, Auburn, New York, and Amerian Optical Corporation, Southbridge, MA, 01550.

MYERS, P. I. and HAMMILL, D. D. *Methods for Learning Disorders*. John Wiley and Sons, 1976.

National Advisory Committee on Dyslexia and Related Disorders. Report to the Secretary of the Department of Health, Education and Welfare, India. August, 1969.

National Society for the Prevention of Blindness, 79 Madison Avenue, New York, NY, 10016.

NOONAN, J. R. and BARRY, J. R. Performance of retarded children. *Science*, 1976, **156**, 171.

PARASKEVOPOULOS, J. N. and KIRK, S. A. *The development and psychometric characteristics of the Revised Illinois Test of Psycholinguistic Abilities*. Urbana: University of Illinois Press, 1969.

REGER, R. 'Reading ability and CMAS scores in educable mentally retarded boys'. *American Journal of Mental Deficiency*, 1964, **68**, 652-55.

REGER, S. and NEWBY, H. 'A group pure-tone hearing test'. *Journal of Speech and Hearing Disorders*, 1947, **12**, 61-66.

RESNICK, L. B., WANG, M. C. and KAPLAN, J. 'Task analysis in curriculum design: A hierarchically sequenced introductory mathematics curriculum'. *Journal of Applied Behaviour Analysis*, 1973, **6**, 697-710.

ROACH, E. G., and KEPHART, N. C. *Purdue Perceptual Motor Survey*. Columbus, OH: Charles E. Merrille Publishing, 1966.

ROBINSON, N. M. and ROBINSON, H. B. *The Mentally Retarded Child*, Second Edition. Toronto: McGraw–Hill Book Company, 1976.

ROSS, A. O. *Learning Disability: The Unrealized Potential*. McGraw–Hill, 1977.

SALVIA, J. and YSSELDYKE, J. M. *Assessment in Special and Remedial Education*, Second Edition. Boston: Houghton Mifflin Co., 1981.

School Vision Tester. Bausch and Lomb, Rochester, NY, 14602.

SHELTON, R. L. Review of the *Goldman–Fristoe–Woodcock Test of Auditory Discrimination* in O. K. Buros (Ed.), *Seventh Mental Measurements Yearbook*. Highland Park NJ: Gryphon Press, 1972.

Sight Screener. American Optical, Southbridge, MA, 01550.

SILBERT, J., CARNINE, D. and STEIN, M. *Direct Instruction Mathematics*. Columbus, OH: Merrill, 1981.

SILVERSTEIN, A. B. 'The measurement of intelligence' in N R. ELLIS (Ed.), *International review of research in mental retardation* (Vol. 4). New York: Academic Press, 1970.

SKEELS, H. M. 'Adult status of children with contrasting early life experience'. *Monograph of the Society for Research in Child Development*, No. 3, 1966.

SMITH, R. M. and NEISWORTH, J. T. *The Exceptional Child: A Functional Approach*. New York: McGraw-Hill, 1975.

SNELL, M. (Ed.), *Systematic instruction of the moderately and severely handicapped*, Second Edition. Columbus, OH: Charles E. Merrill, 1983.

STOKES, T. F. and BEAR, D. M. 'An implicit technology of generalization'. *Journal of Applied Behaviour Analysis*, 1975, **10**, 349-67.

Titmus School Vision Tester. Titmus Optical Vision Testers, 1312 W Seventh Street, Piscataway, NJ, 08854.

TURNURE, J. E. 'Outerdirectedness in EMR boys and girls'. *American Journal of Mental Deficiency*, 1973, **78**, 163-70.

VAUGHAN, D. and ASBURY, T. *General Ophthalmology*, Eighth Edition. Los Altos: Lange Medical Publication, 1977.

VINCENT, L., SALISBURY, C., WALTER, G., BROWN, P., GRUENEWALD, L., and POWERS, M. 'Program evaluation and curriculum development in early childhood/special education: Criteria of the next environment' in W. Sailor, B. Wilcok, and L. Brown (Eds.), *Methods of Instruction for Severely Handicapped Students*. Baltimore: Paul H. Brookes, 1980.

Vision Technician's Manual for Screening Preschool Children. Lansing: Vision Section, Michigan Department of Public Health, 1979.

WANG, M. C. *Diagnostic Tests for the Quantification*

Curriculum, Units 1-8. Pittsburgh: Learning Research and Development Centre, University of Pittsburgh, 1973.

WEAVER, S. J. 'Effects of motivation and inter-personal reaction tendencies in intellectually subnormal children'. Ann Arbor, MI: University Microfilms, 1966.

WEPMAN, J. M. *Wepman Auditory Discrimination Test.* Chicago, IL: Language Research Associates, 1978.

WHITE, O. R. 'Adaptive performance objectives: Form versus function' in W. Sailor, B. Wilcox and L. Brown (Eds.), *Methods of instruction with severely handicapped studetns.* Baltimore: Paul H. Brookes, 1980(a).

WHITE, O. R. 'Child Assessment' in B. Wilcox and R. York (Eds.), *Quality educational services for the severely handicapped: The federal investment.* Washington, D.C.: Bureau of Education for the Handicapped, 1980(b).

WHITE, O. R. and HARING, N. G. 'Evaluating educational programs serving the severely and profoundly handicapped', in N. G. Haring and D. D. Bricker (Eds.), *Teaching the Severely handicapped*, Vol. 3. Seattle, WA: American Association for the Education of the Severely and Profoundly Handicapped, 1978.

WIENER, G., CRAWFORD, E. E. and SNYDER, R. T. 'Some correlates of overanxiety in mildly retarded patients'. *American Journal of Mental Deficiency*, 1960, **64**, 735-39.

WINTZ, H. *From Syllable to Conversation*: Baltimore, MD: University Park Press, 1975.

WONG, D. and SHAW, C. P. 'Identification of impaired hearing in early childhood'. *Canadian Medical Association Journal*, 1979, **121**, 529.

WRIGHTSMAN, L., Jr. 'The effects of anxiety, achivement motivation, and importance upon performance on an intelligence test'. *Journal of Educational Psychology*, 1962, **52**, 150-56.

YANOB, R. and ZIGLER, E. 'Outerdirectedness in the problem-solving of institutionalized and uninstitutionalized normal and retarded children'. *Developmental Psychology*, 1971, **4**, 277-88.

ZIGLER, E., BALLA, D. A. and BUTTERFIELD, E. C. 'A longitudinal investigation of the relationship between preinstitutional social deprivation and social motivation in institutionalized retardates'. *Journal of Personality and Social Psychology*, 1968, **10**, 437-45.

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Dr. David Baine, Associate Professor of Educational Psychology, University of Alberta, Canada, has invested his entire research and teaching career in the area of Special Education to become one of the leading Canadians in the area. His down-to-earth practical approach to issues in special education has significantly affected psychology. As a Visiting Professor at the Centre, Dr. Baine gave a number of lectures and seminars on various topics in the area of special education.

The Language of Philosophy

Margaret Chatterjee

The book analyses in depth the language philosophers of different persuasions have used, showing up the inadequacy of the linguistic analyst's understanding of language. The use of language by philosophers is shown to have a close connection with the view they take of reason. A truncated view of language is found to go along with an artificial separation betweeen reason and imagination. The author uses a phenomenological method to highlight the innovative language philosophers use to get their views across. For example, philosophers make extensive use of metaphors in their arguments. This is illustrated with reference to thinkers as diverse as Kant, Husseri and Heidegger and leading thinkers in the analytic camp such as Wittgenstein and Waismann. Two chapters come to grip with the latest discussions on the meaning of metaphor. The fears that metaphysical discourse may be radically undermined by Freudian analysis or radically discredited through the charge of approximating of poetry are examined in detail through a discussion of, respectively, Lazerowitz and Heidegger, Coleridge and Heidegger are compared in a novel manner as leading examples of, respectively, a poet influenced by philosophy and a philosopher influenced by poetry.

This book has been co-published with Allied Publishers by Martinus Nijhoff, The Netherlands, in their Martinus Nijhoff Philosophy Library Series (No. 4, 1981).

1981 **Demy 8vo** **viii+139 pp.** **Rs.50.00**

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BANGALORE HYDERABAD AHMEDABAD

ISBN 81-7023-082-9